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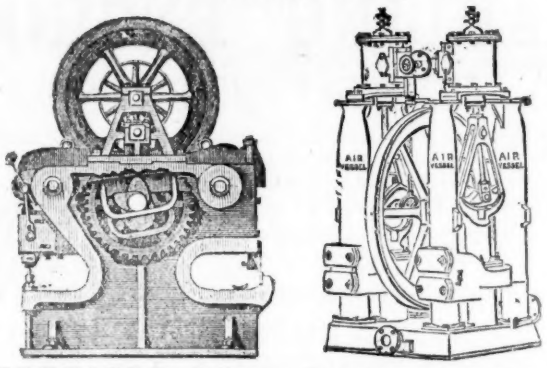

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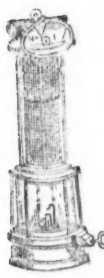

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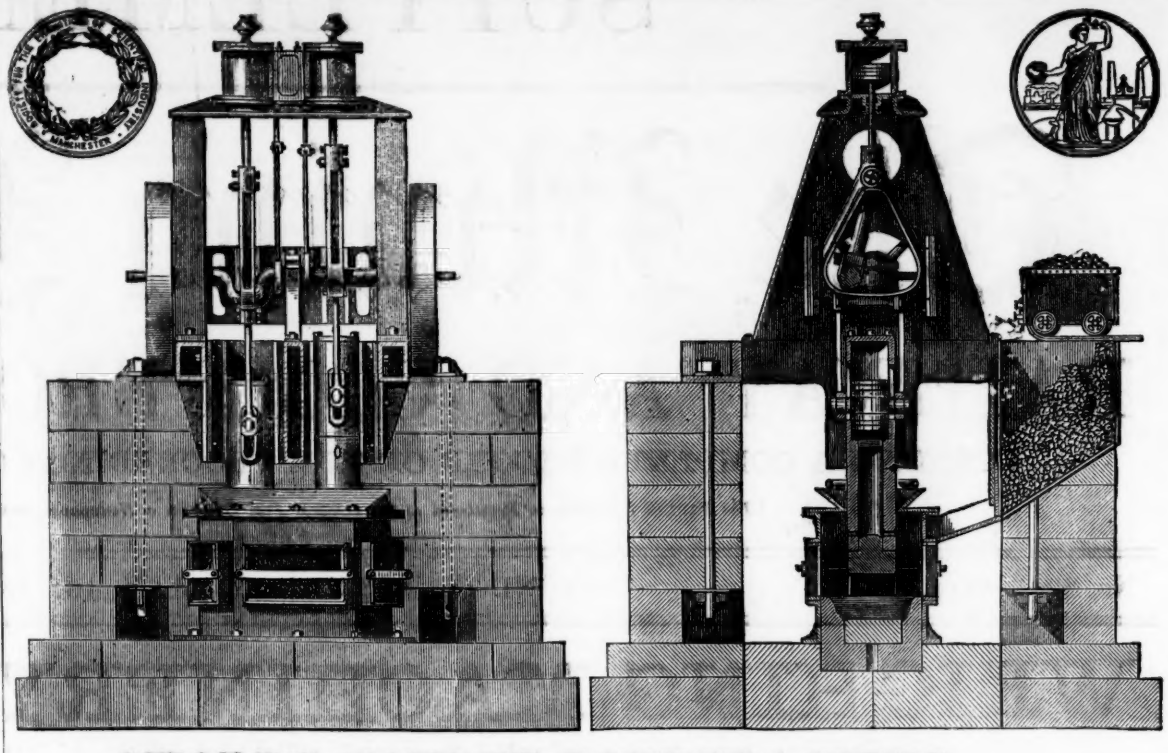

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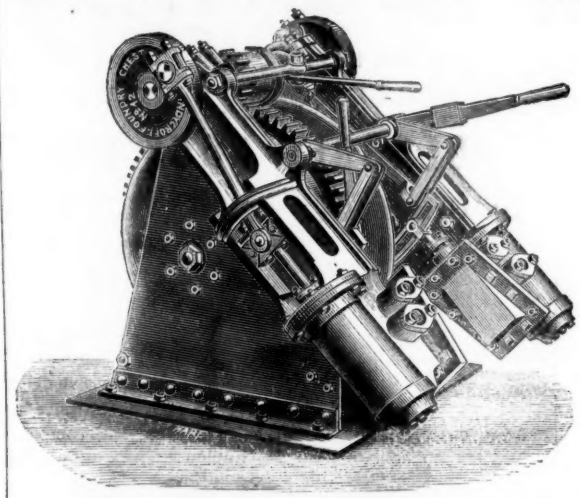

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THE COMMISSION OF ENQUIRY ON COLLIERY ACCIDENTS—No. II.

SIR,—The lighting of mines is one of the most momentous subjects that will come under the consideration of the Commission, for a mine may be sufficiently well ventilated to clear away the carburetted hydrogen gas evolved under ordinary circumstances, but should a sudden issue of this gas spread over a certain area of the workings it is to the system of lighting the mine we must look for as perfect a safeguard against such casualties as explosions as is possible to be provided. The system of lighting mines by electricity, though much discussed of late, is now seen to be quite impracticable, at least for the working parts of mines; not only from its costliness, but also from the difficulty of lighting all the passages, such as tram-roads and pony roads, in an efficient manner, and the further difficulty of keeping the lights always covered and protected from falls of coal and stone, so as to avoid any contact of the light with fire-damp. The portable safety-lamp is the most convenient instrument for lighting mines generally, and of the great variety of lamps invented for this purpose it will not be difficult to select two or more which would fulfil all the conditions requisite for a safe light for fiery mines—such as being self-extinguishing in explosive mixtures, not transmitting an explosion of gas to the outside of the lamp either under a high or low velocity of current, giving a light fully equal to that of a miner's candle, and finally, making the lamp thoroughly secure by double protection, both in the upper and lower portions of it.

A much needed security in the working of mines would thus be obtained by using lamps of this description; explosions are sure to occur where imperfect lamps are used; the conditions required in a safety-lamp, as given above, must be fulfilled, and it is suggested that experiments be instituted with the view of ascertaining which is the most reliable safety-lamp under all conditions of a mine. Experiments with this view have locally, but perhaps rather imperfectly, been carried out. The conclusions so far arrived at have, however, mainly been as follows:—"The chief points to be observed in the selection of a safety-lamp, properly so-called, are—1st. Immediate and visible indication of foul air in however small a proportion.—2nd. Prompt extinction if the proportion even approaches the most dangerous admixture.—3rd. A light sufficient to remove any temptation on the part of the miner to tamper with his lamp. The first of these conditions is amply met by the principle of both the Williamson and the Morison lamps; the other two conditions being also very strong features in their construction. Further, each of these lamps being in every part practically one safety-lamp inside another, it may be considered almost beyond the range of contingencies that any danger should arise from them in any explosive mixture."

The opinion held by most mining engineers of the present day is that the use of gunpowder is highly dangerous in fiery mines; it has evidently been the cause of many explosions, therefore the practice of shot firing should be discarded as soon as ever a practical substitute for gunpowder can be found. Though a number of inventions have been tried in mines to do the work usually effected by firing shots, we find but a few of these are continued in use. The new invention of compressed-air cartridges has created a favourable impression, and there is a probability of its being successful, and supplying the want so long needed of a perfectly safe and effectual method of breaking down coal after it has been under-cut. The attention of the Commission will, no doubt, be directed to this invention, and the results obtained from it in practice be carefully considered. It will also, doubtless, be submitted to the judgment of the Commission how far holing or under-cutting coal by compressed-air machines may obviate the use of explosives, by leaving, especially in longwall working, the face of the coal in a state ready to fall by its own weight.

The following suggestions may be added as further aiding in preserving a safe condition of our mines:—

1.—Mechanical ventilators (which will form the subject of a subsequent letter) are recommended in all important mines in preference to furnace ventilation. If the latter system is used the furnace should be supplied with fresh air, not return air from the workings, which might be more or less charged with fire-damp, and therefore productive of great risk, more especially in mines subject to a sudden issue of gas.

2.—An indicator, such as that of Mr. Liveing's invention, should be placed daily in all return air currents to ascertain the amount of fire-damp in mixture with the air. This would furnish a guide as to whether each division of the air was sufficient in volume to dilute the gases, and also whether an extraordinary quantity of gas was being evolved in any one or more parts of the mine.

3.—The workings in operation of a mine should be limited in their extent in each separate district as much as possible, this admits of their being more easily ventilated, and the roads, &c., are less costly in maintenance. An ample supply of air and a proper distribution of it to every place is essential. This could be ascertained by inspections made from time to time by qualified persons.

4.—Where the longwall system of working is practised it is desirable, for considerations of safety, that the excavated part left behind as the working proceeds should be filled up, or packed, as far as possible with stone or other refuse. By adopting this method less room is left for fire-damp to accumulate behind the workers; no dangerous falls can take place, which otherwise would occur, and occasion a rush of gas into the workings in operation at the time.

Suggestions such as these and the resources of science will, we doubt not, give a more definite form to the regulations for carrying on our mines, and indicate to us a way to prevent explosions as far as that is possible. M. E.

COLLIERY MANAGEMENT.

SIR,—It is a welcome sign of good times coming to all interested in colliery management when questions mainly affecting the safety of working colliers agitate the minds of directors, and disturb the equanimity of the Secretary of State. I, therefore, venture to trespass on your space for the sake of adding to the ventilation of a question which apparently is one of difficulty to Mr. Cross and other well-meaning legislators. The facts giving rise to this correspondence I have gathered from "A Colliery Director's" letter and your able article, which I accordingly beg to supplement by the results of my own experience. A colliery, however limited in magnitude and area, presents ever-varying features of mining dangers, whether atmospheric or geological; the complications of machinery necessitated by the advance of science are many; the natural carelessness of ignorant and uneducated miners is too well known—all of which must require the master eye of a certificated manager on the spot, and daily in the mines. To "supervise" upon reports drawn up by uncertificated inferiors is inadequate to the danger of mining and the immense risk of human life necessarily involved. To "supervise" upon such reports at a distance and with the probability of other engagements is obviously absurd. Imagine the certificated manager instanced in the correspondence with Mr. Cross "supervising" two collieries in the same district. At 9 A.M. suppose a report is sent him from No. 1, two miles off, which necessitates the postponement of appointed visit to No. 2, and extraordinary visit to No. 1. Well, at 9·15 A.M. an unforeseen accident of a serious nature occurs at No. 2. Where is the manager? They are hourly expecting him. No one is capable of taking the lead or of giving reliable advice. No message is sent to the absent one, until his messenger, supposing him to have been careful enough to have sent one to apprise them of his necessary absence, has arrived. He is (say) four miles away—by that time probably down in a pit. How much valuable time—how many lives may be, have been, lost before the one man can actually take the management and control, in whose hands are entrusted and on whose head depend the lives of hundreds of his fellow creatures?

I may be imagining an extreme case; but that life should be weighed in the balance with economy, or that the competent abilities of one manager should be divided over the management of several mines seems to me so preposterously careless as to call for the most extreme light of criticism. All my experience leads me to conclude with you that there is no one man who can do his legal and moral duty by more than one colliery at a time, and that that one man should be on the spot ready for an emergency, which may arise at any moment. The law ought to be interpretated not by technicalities, but by its intention; and I take it that the intention was extra security to miners' lives. Such a security—such an intention—cannot be carried out by one man supervising from a distance, or managing more than one colliery.

ANOTHER DIRECTOR.

TEALE'S SAFETY-LAMPS.

SIR,—Mr. Teale having made a number of fallacious assertions on this subject, and provoked a contest with me, has written to say he would rather have nothing more to do with me and my lamp, hoping thereby to close correspondence, that his statements may drop out of memory; in fact, he has run away. How far his wish can be granted now rests with me. Considering that he is a professional safety-lamp maker of Manchester, and that I am an officer of Artillery, the teaching on safety-lamps ought to come from him; but, as he has shown himself so ignorant of the principles involved, and the stake in life and property is so great, as a public duty I cannot let him off. Fighting is real work, and I am hardly the sort of antagonist that retires in a hurry. I go in to win on all occasions, and stand or fall by the result. Mr. Teale must do the same. I have not a shadow of objection to being attacked by anyone; but being so I expect my opponent to stand to his guns, and if he will not he must take the consequences. Shortly I hope Mr. Teale shall have a fine opportunity of another combat with me, when I trust he will appear with his best lamp and best abilities. What can be fairer?

J. D. SHAKESPEAR, F.G.S., Assoc. Inst. C.E.

Baron's Court, Fulham, May 8.

THE LONDON COAL SUPPLY.

SIR,—My last correspondence in the Journal of April 26 and May 3 conveys to the proprietors of the Hull Docks the important information that whereas the import of coal into the Metropolis, by last year's official return, was 8,794,576 tons, upon which an average saving in cost of transport *via* Hull is shown capable of being effected of 5s. a ton (upwards of 2,000,000*l.* sterling per annum) over rail and Tyne transit, and with attendant expenses in the former case from pit's mouth; in the latter, to avoid any entanglement of calculation arising from multitudinous varied distances traversed on the North-Eastern system, colliery wagon ways, &c., which may be found to create a slight difference of cost of the coal f.o.b. from the Humber and the Tyne respectively to the metropolitan consumers' premises by estimating only 5,000,000 tons, the annual revenue of the Hull Dock Company will be augmented to the extent of upwards of 60,000*l.*—a perfectly fresh source of income, quite apart from existing traffic to all parts, amounting by official returns to 448,450 tons in 1877, and 442,303 tons in 1878—a decrease of 6147 tons. From all the Humber ports last year's official return shows a seaborne import of an infinitesimal fraction over ¼ per cent. of the aggregate in average cargoes of 68 tons per vessel. It appears to me the most practical basis of bringing the proposed undertaking into existence is primarily to form a syndicate in Hull. At the minimum saving on rail and Tyne transit with attendant expenses, as set forth in my precited correspondence, a profit of cent. per cent. per annum will accrue to the shareholders of the proposed undertaking, illustrative of the overwhelming disparity between existing cost of coal transit by rail to London, and what can be accomplished seaborne by proposed means, stated by the highest technical authorities to be perfectly feasible, the leading railway authorities having in addition given their public unqualified declaration of the impossibility of rail competing with sea transport. With the precited large margin of 5s. per ton saving at disposal agreements with the numerous coalowners to ship their outputs by this undertaking for a lengthened period will at such saving secure to the shareholders a dividend of 10 per cent. per annum after payment of insurance, repairs, redemption fund, management, and every possible item of working expenses, &c., constituting a safe, durable, and remunerative investment; of course, a much higher rate of dividend can be distributed, a large margin remaining in favour of seaborne transit. By daily departures from each end all the goods traffic to Manchester, Leeds, &c., can be absorbed by this undertaking at rates of carriage incomparably lower than by rail; in many cases at a moiety charged by them, which has not been taken into account, and which will largely augment the revenue. The working expenses will not weigh on the goods traffic, as the same are charged to the coal both ways, with slight exceptions; of course, there will be no interference with the express traffic of minor importance. The Chairman of the the South Yorkshire and North Derbyshire Coal Owners' Association stated before a Parliamentary Committee—Great Northern and Great Eastern, 1878, campaign—that "dispatch cheapens immensely the cost of transit by sea." Dispatch is the acumen of this undertaking, which is by end to end hatches, enabling a much greater number of cranes to be applied than in any existing screw collier, as well as a much larger number of hands to load and discharge.

To avoid the fogs, dark nights impeding the navigation of the Thames, the intricate crowded navigation, collisions being almost of daily occurrence, the latest improved screw collier having sustained considerable damage, detention at the derrick, &c., the discharge will be affected at the always, in all weathers, and in all states of the tide, accessible and perfectly sheltered harbour of Harwich and Queensborough, into the company's decked barges of light draught, and towed to alongside the above bridge and other wharves in the Thames and north and south side canals by the company's tugs, an exuberance of time being allowed towards ensuring regularity of return of the lighters before that of the sea-going steamers to Harwich or the Medway.

Mr. William Green, senior of one of the largest firms on the Coal Rxchange, stated in evidence before a Parliamentary Committee, on April 2 last year—"We have tried to sell Yorkshire coal with a perfect failure as result." Without entering into a prolix discussion as to the relative value of smokeless Welsh and semi-bituminous Yorkshire steam coal, it is incontrovertible that a mixture presents advantages in the case of war ships in a much greater degree than with merchant shipping, but when we come to analyse Mr. Green's further evidence—"The bulk of consumers won't look at relative value of article, they buy simply what is cheap not what is good"—we discover the preponderating advantages of the proposed transport. Hitherto Yorkshire steam coal has been, and continues to be, mulcted with a very heavy charge for rail transit, which I need not enter further into, but when it can be demonstrated that Yorkshire steam coal can be put into steamers bunkers, by reason of the reduced rate of proposed transport, at a minimum saving of 6s. a ton, much more if conveyed in sacks, over Welsh, it does not require any flowers of rhetoric to prove the immense impetus to the sale of the inexhaustible supply of Yorkshire steam coal. In lieu of large valuable ships proceeding to the Tyne to load for China, the East Indies, South America, &c., certificates in my possession of the largest importing Government of British coal, shipowners, coal shippers, ship brokers, &c., show that Yorkshire coal forwarded *via* the Humber for transhipment in the London Docks, can be delivered at port of destination much lower than from the Tyne, by reason of the saving in ship's expenses, insurance, risk, damage and delay in proceeding to load in the Tyne, reducing the freight several shillings per ton in the Thames. WM. JOSEPH THOMPSON.

Little Tower-street, May 7.

NEW ZEALAND KAPANGA.

SIR,—As a shareholder in this company, I have received a circular asking subscriptions towards preference shares, and giving certain extracts from Capt. Thomas's report, Feb. 3, going to prove a valuable mine if funds can be raised to develope it. The circular states, "The report from which the above extract is made is here, and the directors hope the shareholders will call and peruse the same." I wish to observe that it is unlikely the bulk of the shareholders can do this, and to suggest fuller extracts be regularly published in your valuable Journal, as shareholders naturally think they have a right to all the information respecting their property, and the more they are confided in by their directors and secretary the less likely is a really good undertaking to be stopped or kept in a lingering condition for want of funds to prosecute it to a successful issue. If full reports were published in the Journal I am convinced it would act as a stimulus to all connected with it.

May 7. AN OUTSIDE SHAREHOLDER.

THARSIS COPPER ORE COMPANY.

SIR,—Having read various anonymous letters in your esteemed Journal referring to claims I and others may have against the Tharsis Copper Ore Company, I beg to state that I have neither written them nor authorised anyone to do so for me.

Linares, April 30. H. A. HASELDEN.

THARSIS COMPANY.

SIR,—Perhaps enough has been written about Haselden and Gosse's action, but there are one or two points in the letter of their London friend which you inserted last Saturday which call for a reply. I meant no disrespect to your Journal when I stated that I had not observed any notice of the action in any other paper. I merely stated a fact, and so far as I know it still remains as I put it. The consequence is that not above a score of Tharsis shareholders may have ever heard of the action, though it threatens their very existence, and I am convinced that of the score not one believes in its reality. The practical proof of this is that, notwithstanding a fall of 20 per cent. in copper, the Tharsis shares are at 115 prem. If it were believed that Haselden and Gosse had any case in law the shares would be at a discount.

But do Haselden and Gosse themselves believe in their case? It does not look like it when they content themselves with a decree in absence by a French Court against a Scotch company, which it does not require a lawyer to know is so much waste paper. If they believe in their claim letthem follow their debtor to the Courts to which he is amenable. They aver that the Tharsis Company have fraudulently appropriated some 3000 shares of the Huelva Company, the property of them, Haselden and Gosse. If this be true, let them bring an action before the Court of Session for delivery, and not potter before the French Courts, who have no more jurisdiction against the Tharsis Company than they have against the Czar. When they take this obvious course it is probable they will attract the attention of the Glasgow papers, but until they do so I think their London friend will find it difficult to fulfil his promise that the Glasgow papers will allude to the case. The Tharsis Company is deservedly a popular one, and the Glasgow papers will insert nothing against it unless convinced of its truth, and even then your correspondent will find it difficult. I beg to add, in conclusion, that I have never asserted that I am the mouthpiece of the Tharsis Company. A LAWYER.

SHOULD OUR MINING POPULATION BECOME SHAREHOLDERS IN MINES.

SIR,—Some months ago, when writing on "Strikes," I very incidentally referred to an important subject for the consideration of our great mining population—that of associating themselves with sound mining companies as shareholders; but no one took up the matter. The subject of paying purchase-money for mines has been well ventilated, and may continue to be for some time—though, personally, I think I have about finished my little say; so that probably the subject I have mentioned may be considered by some of your very many intelligent correspondents worthy of a full discussion, and as in the future it is most important to put mining upon as sound a basis as possible when better times come, and the sun of prosperity once more cheers our hearts, I hope it may be regarded as a subject of considerable importance. Many persons are in favour of the Cost-book principle; but, if I might presume to suggest, let us not discuss the relative merits of the Cost-book and Limited Liability, but is the latter a system to be recommended for adoption by the working miners of England. Some few years ago Mr. Macdonald, M.P., addressed a meeting of miners at Dalton-in-Furness, in the heart of our vast hematite iron ore district, and he then strongly recommended the miners to secure royalties for themselves, and work them. A small attempt was subsequently made by a friend of mine, who is a true and genuine friend of the miners; but it fell through, as I believe, for this reason, the royalties secured were not worth much—so that attempt in no way affects the value of the general question. Nearly every acre of valuable mineral ground in this district is either taken or held over by the lords for large companies, who will eventually take them. This is not a district, therefore, where the principle could be successfully tried, and the experiment I have mentioned goes for nothing.

Probably some of your correspondents may be familiar with cases in point which may throw some light practically on the wisdom or otherwise of working miners becoming shareholders in mines, and either by themselves or in conjunction with others of more wealth and position developing mining properties. I do not know whether Mr. Macdonald, Mr. Burt, or Mr. Pickard, and other leaders and advisers of mines look with favour or otherwise upon this subject, nor do I know (what is, perhaps, far more important) whether the miners themselves have any strong or decided opinion upon it—nor am I aware whether many or any of that class read your valuable paper, so that I feel as if I was groping in the dark, and must wait for light.

Should there be a strong feeling in favour of the Cost-book System to effect the object I have suggested by all means let us have its advantages laid before us. The grand idea is to bring our mining population more directly interested in mining adventures. I hope that some known correspondent will give the ball a start, as I apprehend there will be no difference of opinion as to the importance of the subject whatever differences may be eliminated as to the best mode of successfully carrying it out. WILLIAM SALMON.

May 6.

IS IT RIGHT TO PAY ANY PURCHASE-MONEY FOR MINES?

SIR,—Mr. Hoskold, in his letter published in last week's Journal, makes what appears to me a most ungenerous and altogether uncalled-for insinuation when he states "there does seem to be a *close connection* between Ulverston and Devon." (The italics are mine.) What does he mean? I am not sensitive in controversial matters, and prefer to be considered a pachyderm; but, to speak deliberatively of a "close connection" between Mr. Erwen and myself must give any disinterested party the impression that either Mr. Erwen and myself are one and the same person, or that we are acting in collusion to mislead your readers. The controversy must be kept above personalities and insinuations. Had Mr. Hoskold said there was a *resemblance* in our arguments, as there is in our opinions on the subject under discussion, I should have been silent however wide he might have been of the fact; but, if I know myself at all, I may say I am incapable of an attempt to establish any "close connection" with anyone in order to mislead. The question we are discussing has to be settled by fair manly and honourable arguments honestly put forth. If Mr. Hoskold can scatter my arguments to the winds let him do so with all the *fortiter in re* he can command; but so far his letters are very mainly confirmatory of my views. Let us, however, have the *suaviter in modo* preserved in all my letters. There are some points in Mr. Hoskold's letter I might refer to; but, as they are so mixed up with an attack on Mr. Erwen, I must leave that gentleman to deal with them as he thinks best. Of one thing I am sure, he will with me disclaim the imputation of a "close connection" between us.

I am glad to find Mr. Pagen agreeing with my opinions. May I, in perfect good humour, say there is no "close connection" between Ulverston and Plymouth? I do not know Mr. Erwen, although we are brother geologists. Mr. Erwen's illustration as to the Times Share Market is unanswerable. Most undoubtedly if a person pays a premium for shares in a mine he is *pro tanto* paying a purchase-money for a part of the mine. The principle is precisely the same as if he were to give 10 per cent. for a mine capitalised at 100,000*l.* or 10,000*l.*, and if he should realise 20 per cent. on a re-sale he would gain 10,000*l.*—and for such a consummation even Mr. Hoskold

would say he did a right thing. In this lies the whole gist of the question, and I am not called upon to deal with any extraneous matters or side issues. Supposing we were discussing the question —Has the moon an atmosphere? It would be perfectly idle for anyone to raise the point that we have must first prove that the sun had an atmosphere.

The share-lists of all banks, railways, and other companies carry out the principle I am contending for. Why do persons pay premiums? Because there is, or they think there is, a pecuniary advantage to be derived by doing so. And let it not be forgotten that the principle of paying purchase-money for mines beyond the charges for royalties is one to be determined altogether apart from the specific amount to be paid in any particular case. A B has a mine which has for several years been paying yearly a profit of 10,000*l*., and there is every prospect of that agreeable return happening for the remainder of the lease. He offers to sell it me; but can anyone suppose for a moment he would put into my hands a mine which would yield me 10,000*l*. a year profit without my paying him an adequate purchase-money? Every reader will answer "No." Well, then, the question I have contended for is at an end. As I have said over and over again what the amount to be paid should be is quite another matter. My first letter on the general question of paying purchase-money for mines was written after reading several letters in the Journal, wherein the writers contended very strongly that the system of paying any purchase-money for mines must be repudiated altogether. I have endeavoured to the best of my ability to take the converse view of the question. I have but very incidentally and casually indicated anything about the amount to be paid—that being a different matter, and in settling which will have to be decided by the circumstances of each particular case. The principle of *ex uno disce omnes* has no application whatever in determining the amount to be paid. I should, however, be very glad to read a letter from Mr. Hoskold (if he is disposed to enlighten us with his views) showing his mode of estimating the amount of purchase-money to be paid for a mine, although it appears to me more a matter of private professional advice than one for public discussion.

May 6. WILLIAM SALMON.

IS IT RIGHT TO PAY ANY PURCHASE MONEY FOR MINES?

SIR,—In last week's Journal I find a letter, signed William Johnson, and in it he says—"If Mr. Hoskold and myself were engaged to settle the question of purchase-money to be paid for any particular mine then we should have to go minutely into many of the questions he proposes; but he will see that I have all along avoided details, and have confined myself as much as possible to showing that if a purchaser can make a large sum of money out of a mine after paying for it he is justified in paying a purchase-money. If a mine were of a certain size, and we could determine how much mineral there was in it to an absolute certainty, and how many years it would take to exhaust it, and the cost of getting, and all other expenses to bring the mineral to a market then the case would be as simple as estimating the price to be paid for the purchase of the bullion in the Bank of England. I cannot, however, do that. With regard to the iron mine I cannot give the details he asks for; but I know sufficient of the cost of mining in this district to justify me in the conclusion at which I have arrived. Besides, the mine is not in the market, and no one but myself knows to what mine I was referring." When Mr. Johnson says "but I know sufficient of the cost of mining in this district to justify me," &c., what district does he allude to? Now, this general mode of putting is very strange as coming from Mr. William Johnson, because I do not know of any such person having previously entered into this discussion; consequently, I could not have put any questions to him about the iron mine, and, therefore, it is extremely absurd for Mr. Johnson to say—"With regard to the iron mine I cannot give the details he (meaning myself) asks for." I have compared the figures he asks for. I have compared the figures Mr. Johnson gives with what he professes to give in a letter written by him of Nov. 30, 1878, under the title of "Silver-Lead, and South Devon Silver Mines" (I presume), and signed "F. G. S.," Ulverston. I can find no other letter corresponding to his description. At present I refrain from making any remarks upon his figures. If Mr. William Salmon's name had been appended to the letter published in the Journal of the 3rd inst., instead of that of William Johnson, I could have understood its bearings and connections better; but coming from Mr. Johnson it is confusing. Until the anomaly is cleared up I shall make no further remarks upon the letter. I will, however, look into the figures contained in the two letters I have specially referred to, and state my views upon them another time.

Referring to Mr. Salmon's letter in the Journal of March 26 he states—"I omitted to mention some figures with reference to the iron mines illustration. Profit at 10s. on 1,000,000 tons would be 500 000*l*., and I mentioned a profit of 50,000*l*. per year for five years, or 250,000*l*. The omission I made was as to the remaining 250,000*l*., which, taking round numbers, I put down as the purchase, which should, of course, be recouped in the five years, in addition to the dividend of 50,000*l*. per annum for that period." Mr Salmon calls the purchase of the mine worth a present sum of 250,000*l*., or according to my calculation a present gross year's purchase of 2 51033. This would allow a purchaser 21 per cent. per annum upon his capital; but, as Mr. Salmon would give the purchaser the lion's share, the year's purchase should not in my opinion be more than 2·28125, and redeeming the capital within the time stipulated the gross value would then be 228,125*l*.; but if it was necessary to spend any capital, which it is likely would be the case in procuring the result he states, the purchase-money should be less, of course. In my opinion, he means that the dividend of 50,000*l*. per annum for five years should also be recouped in that time. This 50,000*l*. dividend appears to be taken upon the investment, or capital of 250,000*l*., at the rate of 20 per cent. per annum.

Mr. Salmon is evidently in error as to his idea of recouping the dividend of 50,000*l*. per annum, as there is no principle whatever involved in that. Perhaps he would be good enough to look into his figures again, with a view to determine how this discrepancy has arisen.—*Madrid, Spain, May* 5. H. D. HOSKOLD.

CORNISH MINING, AND ITS UNWROUGHT GROUND,

SIR,—The prominent importance of this subject to the great staple industry of the Western Counties, and especially to those who embark a small capital in it, becomes apparent as the resources of new ground is being developed, notwitshtanding which the continued apathy of the public towards this enterprise is somewhat puzzling. Ground adjoining established mines, with rich lodes running into it, continues to be neglected, while others, after making trial on a small but safe scale, have so far succeeded as to require only a little more outlay to place them in the category of rich mines, are quite overlooked, such properties tending to enrich those who embark a small sum, the extent of loss, assuming the whole amount to be sunk, can be represented by a few pounds, while the profits in many instances are of a fabulous extent, as in the several cases of Devon Great Consols, Tresavean, Wheal Buller, Great Consols, South Caradon, and others too numerous to enumerate here. The first-named was divided into 1024 shares, cost only 1*l*. per share. The first year of working (1844), before half the call was spent, a discovery was made, and a profit of 80,000*l*. divided among the shareholders, and the shares rose in market value from 1*l*. to 800*l*. each, and the profits since which amounting to just 1,500,000*l*. sterling. Tresavean, with a capital of 1000*l*., divided in the one year of 1833 60,000*l*., and the shares sold for 600*l*. each. Wheal Buller, with a less outlay than 1000*l*., the shares rose to 500*l*. each, while at the Great Consols, in Gwennap, with a nominal outlay, it divided among the proprietary in 18 years 320,000*l*., the shares standing in market value at 1000*l*. each. South Caradon commenced operations on the small scale of driving the adit level at a cost of a few hundred of pounds, resulting in the discovery which has given large annual profits for over 40 years, and still continues prosperous, with every probability of a long continuance. The market price of the shares for a long time remained at 800*l*. each. The extraordinary results obtained from the five mines enumerated were obtained from the development of new ground. There are pieces of unwrought mineral ground constituting large setts throughout the county holding out prospects of success quite equal to those mentioned, requiring only a little enterprise on the part of the public to open up untold wealth. I may here quote one instance of a level from one of the richest mines in the county being driven up to within a few feet of the boundary entering a piece of unexplored ground which has been taken by some some enterprising persons, the lode in which is valued at 40*l*. per fathom, going into this unwrought ground at a depth of 80 fms.; assuming the mineral to hold up 50 fms., and for only 6 ft. in length, would represent a value of 2000*l*., yet the aggregate market value of this property is put down at 9000*l*., simply because it is not known to the outside public, rendering void the old adage that "good wine needs no bush." This is one of the several properties which I predict the year 1879 will verify the assertion often expressed by the writer that mining fortune making always was, and still is to be, found in the unwrought ground of Cornwall. CHARLES BAWDEN.

St. Day, Scorrier, Cornwall, May 7.

MINING VICISSITUDES AND DESPONDENCY

v. ENTERPRISE.

SIR,—The mining market is somewhat relieved from recent discoveries of lead ore at Talybont. The back of the lode for 25 yards in length is said to yield from 8 in. to 3 ft. of solid ore—72 to 75 per cent. of metallic lead. This company was on the point of being wound-up—*i.e.*, a general meeting had been convened for that purpose, thus the discovery was made just in time. One of the shareholders has offered to subscribe 1000*l*. if the remaining proprietors, over 500 in number, find an additional 4000*l*. to open out and develope the lode in depth, erect the required pumping, drawing, and dressing machinery, and so extract expeditiously the ores and render them marketable.

This circumstance recalls to my memory an occurrence at East Crofty when I first engaged in mining pursuits, under the auspices of my father, about the years 1835 or 1836. A cross-cut north at the Trevenson part of the company's concession was being extended at the 45, but there was a division in the camp, and every effort was made to render the operations of Capt. Nicholas Tredinnick non-effective. At a general meeting of the shareholders it was proposed to abandon the workings, and but for the strenuous opposition of Capt. Tredinnick a resolucion to that effect would have been passed. He, however, offered to take the shares of all dissentients at valuation of machinery and plant. In consequence it was determined to prosecute the workings for two months longer, but not a day's grace beyond was to be yielded in his favour. Whilst the cost-book was being signed by the shareholders present two miners entered the dining-room at Burgess's Hotel with a hand-barrow of yellow copper ore. The lode had been cut in the 43 cross-cut, and the mine was saved. Capt. Tredinnick immediately left and went underground, and on his return to Camborne, where the meeting had been held, he promised the shareholders of the company the return of the whole expenditure in 18 months, and fulfilled his engagements, and, it was a fact that the shares previously regarded as valueless, became worth 1000 guineas each within six months. The Devon Great Consols was abandoned, yet the great deposit of gossan was discovered, and it was with much doubt and hesitation that a company subscribed 1024*l* to rework it; yet almost immediate success followed, and over 1160*l*. in dividends was paid upon every 1*l*. of subscribed capital. Again, Carn Brea abandoned as worthless, was comparatively unwrought, and under the practical resuscitation of Capt. Lyle a rich deposit of copper ore was discovered by simply driving a few yards, the result being 275 000*l*. dividend on 15,000*l*. capital. Other and many equally striking instances of lack of courage and *esprit* can be referred to in past mining, though they yielded to more enterprising characters immense wealth, and at comparatively small expenditure—as for instance, Wheal Friendship in Devon, Tresavean in Cornwall, with Lisburne in Cardiganganshire, and Minera in Denbigshire:—Taylor, Teague, and Reed were the pioneers.

The two main lodes of the Minera traverse the Lead Era Mining sett, and will shortly be intersected by a cross-cut extended on a north and south lode. Authorities and experts are most unanimous and sanguine in predicting success, whilst the manager, Capt J. A. Ede, writes under date May 6, as follows:—

"Capt. Edward Jones has been urging that he possessed the best piece of ground in the grit formation, but in walking over the sett with me yesterday he was surprised at what he saw, and acknowledged the prospects to be the best he ever witnessed. The 'flat' at No. 2 is really splendid. I never saw prettier ground in my life, and cannot help speaking confidently of the 'immediate future.' I am further supported by many cool, wary headed, matter-of-fact authorities, all of whom arrive at the same conclusion. We are within a few yards of the deeper flat, and as the weather is now dry and fine I hope to-morrow or next day to sink on the furrow into this flat; I hope for good discoveries." R. TREDINNICK,
Consulting Mining Engineer.

Mildmay Chambers, Bishopsgate street, E.C.

FOREIGN MINING AND METALLURGY.

Circulars have been issued with reference to an industrial exhibition proposed to be held in Belgium in 1880. The circulars state that the object of the exhibition is not to illustrate the superiority of one firm over another, but rather to afford the world a further proof of the industrial power of Belgium. Certainly, the exhibition will be an interesting illustration of what can be accomplished by a nation of industrious workers during 50 years of peace and liberty. The industrial events of the week in Belgium have been neither numerous nor interesting. A contract for 200 railway trucks has been keenly contested for. The Belgium Union of Engineers has adopted a *memoire* to the Belgian Government on the intensity of the present industrial crisis.

The South Parisian Tramways Company has been making experiments with steam motors. On one of the most difficult sections of the company's network—from Walhubert to Villejuitz, an engine constructed by Mr. Hughes, of London (which obtained a silver medal at the Paris Universal Exhibition last year), has been tried, and yielded good results. The company is about to try another engine constructed at Aulnoye-Berlaimont, in the department of the Nord, as well as another by MM. Weyher and Richemont.

The Belgian coal trade has presented few features of interest during the week. The strike among the miners of the Barmage has not extended itself, but it appears, on the contrary, to be becoming of less importance. The Vieille-Montagne Zinc Mines and Foundries has announced its dividend for 1878 at the rate of 12*s*. per tenth share.

In the French coal trade there has been no circumstance of importance to note this week. A strike, which occurred a few days since at Lourches, has nearly died out, and it is hoped that the miners will return to work at their former wages. The present is, indeed, hardly the time for strikes, as in some cases coalowners have had to make sacrifices in order to keep their working staffs employed. In their April Session the Councils-General of the Nord and the Pas-de Calais expressed a wish that a canal projected from the Pas-de-Calais and the Nord to Paris should follow the most direct and economical route from a freight point of view. The Councils-General also impressed upon the Government the desirability of executing the works of the canal as expeditiously as possible.

In the Haute-Marne there has been considerable firmness in all descriptions of iron, and some partial attempts have been made to secure an advance in prices. Casting pig has been in good demand, but there has not been much improvement in prices. In the Nord the price of first-class merchants' iron has been carried to 6*l*. 8*s*. per ton at the works, with a scale of 8*s*. per ton per class, and 16*s*. per ton per number. In the Ardennes the iron trade has been characterised by some activity, but quotations have presented little change. In the Loire-et-Rhone the general tone of the market has been somewhat better; there has been no rise in quotations at present, but an advance is considered probable. The profit realised in 1878 by the Mokta-el-Hadid Magnetic Iron Minerals Company was 85,987*l*. Of this sum 72,200*l*. was paid away in dividends, and after sundry other allocations had been made a balance of 18,079*l*. was carried forward to the credit of 1879. The company has purchased the Soumah and the Tafna Mines.

The Bombay Gazettee takes a sanguine view of the prospects of gold mining in India. The known facts that over an immense area extending right across the Peninsula, and including Mysore, the ceded districts of Madras, and Hyderabad, there are large tracts of auriferous soil. The surface washings have been for the most part exhausted by the natives, but there are reefs containing quartz with a sufficient admixture of gold to restore to India her old reputation of being one of the principal gold-producing countries of the world. The possibility of extracting the gold, which is said to be much mixed with other metals, at a cost low enough to make it a marketable product has hitherto been doubted, but the formation of an English company to work Messrs. W. Nicol and Co.'s concessions with quartz crushing machinery is a step in forward. One result has already been the launching in India of several additional projects for gold mining companies. The plain country about Bangalore, and stretching northwards to Cuddapah, is said to be even much richer in gold reefs than the slopes of the Neilgherry Hills, and there is at least a strong probability that all the districts in which the existence of gold is suspected will be thoroughly examined. The Government, it is understood, intend to charge a royalty of 2 per cent., and any companies formed will also have to make their own arrangements with private landowners. The coincidence of these anticipations with the outcries about the scarcity of gold is curious.

MINING IN SOUTH AUSTRALIA.

[FROM OUR OWN CORRESPONDENT.]

Adelaide, March 24.—Your reminder of December last, that it was some time since you had heard from me, would not have been needed had there been anything at present in connection with mining in South Australia worth writing about. The serious and long continued depression in the copper market has had a terrible effect upon us, and instead of employing thousands of men and boys in mining, only a few hundreds are now engaged in the work. The great Wallaroo Mines are stopped; the Moonta is almost in the same position. Our exports of copper and other minerals last year, instead of being worth nearly a million sterling, as they might have been if prices had been remunerative, only amounted to about 400,000*l*., and this year they are likely to be less, unless the rise which has lately been telegraphed from London should continue and increase until a really fair price is reached.

As to the position of our mines, they are as good as ever; in fact, I have heard that there was never more ore in sight in the workings of the Moonta Mine than there is at the present time. The adjoining Hamley property, which many persons think will rival the Moonta in productiveness, is also looking as well as could be desired, and the same may be said of the old Wallaroo Mines. You will hardly expect in times of such depression to hear much of new discoveries, as there is so little encouragement to look for anything fresh; but I am in a position to say that when once the copper market touches the paying point we shall have several new mineral sections opened up. The copper mining property mentioned in my last brief letter as having been taken up by a private company to work near Salisbury, about 12 or 14 miles north of Adelaide, promises well. There is a big lode showing for about 600 yards in length right over a hill about 350 ft. in height. An adit level is being driven in at the foot of the hill to cut the lode; the ground is favourable, and the indications of copper are even better than was at first expected. My friend, Mr. Samuel Higgs, has a very good opinion of the prospects, and already thin veins and strings of muriate and other ores are making their appearance. Several weeks' work has yet to be done before the main lode can be cut. I was rather surprised to learn recently that the old mining district of Kanmantoo, near Callington, was inclined to look up again. The smelting works in the neighbourhood are at work, and I am told that farmers and small settlers in the vicinity cart ore and sell at the works. There were several old mines in the district worked thirty years or more ago, and a great deal of ore is still exposed to view, both carbonates and sulphides. This district is from 30 to 35 miles from Adelaide, and would be directly benefited by the projected railway through the hills to the east of the city, the first terminus being very near the mines.

It has often occurred to me that there is ample scope for the enterprise of English mining capitalists in connection with our silver-lead mines. There are several in various parts of the colony, but all are at present idle, though in many the ore is rich, giving from 65 to 80 per cent. of pure lead and from 40 to 60 ozs. of silver to the ton of ore. Some of them have also been found to yield a very payable proportion of gold—a rather singular combination with silver and lead. Now, I shall be most happy to give all the information and assistance in my power to any persons wishing to go into our silver-lead mines. The mines have been so long idle that I believe the properties could be bought at a low price.

We have lately had the report of coal in South Australia revived. Samples of genuine coal have been brought over from Kangaroo Island, where they are said to have been found *in situ*. I am on the point of starting on a professional visit to the locality to examine and report on the alleged discovery, but I fear I shall not be able to give you any information by this mail. If, however, I can possibly send a brief P.S. I will do so. The persons interested in the former supposed discovery of coal near the bed of the Torrens have suspended work for want of funds, but still profess their confident belief in ultimate success. The owner of the land where the coal is found, at Hog Bay, on Kangaroo Island, has also put in a preliminary claim for the 10,000*l*. reward offered by the Government, at the rate of 1000*l*. for every 1000 tons of coal raised up to 10,000 tons.

Some good work has lately been accomplished in the interior of the colony by boring for water, though in a rough and ready kind of way. The Government, however, have taken a wise step in sending to America for three powerful diamond drill boring-machines. When they are got to work we may hope for grand results.

METAL TUBE MACHINERY.—Machines made according to the invention of Mr. JOSEPH WADDINGTON, of Halifax, comprises an ordinary shear or cutting knife, in connection with which is a holding bar, operated by levers and weights, so as to press upon and hold the sheet firmly during the action of the knife, or cutting the strip when the cutting is completed; the weight is removed from the holding bar by an eccentric, which lifts the levers and holding weights. The edge of the strip is next to be folded, which is effected by the action of a presser bar, the edge of which is so formed as when applied forces a portion of the strip into a grooved bar; another bar, having L-shaped groove, is employed for flattening or turning down the folded part, which folded part serves to hook or attach the strip to a mandril, around which it is turned, so securing the tubular form, and after pressure by ordinary grooved rollers the tube is ready for securing by soldering or brazing. The tubes described are specially applicable for the rollers of under covers of machinery for carding fibres, which heretofore have been constructed in sections. Rollers made as above greatly facilitate the manufacture of under covers at reduced cost, and the side supports of such covers are connected by stay-rods, which are free to work in centres, and such tubes are applicable as weavers' rods.

CLEANING TIN-PLATES.—The invention of Mr. T. M. RICHARDS, of Tonna, Aberdulais, consists of an improved machine for cleaning tin-plates. The said improved machine is composed of a top circle cleaner made to rotate in the one direction, and of a bottom circle cleaner made to rotate in the reverse direction. From the centre of the top cleaner a pipe or hollow shaft is carried up to a hopper containing the bran or material employed in cleaning the plates, such material passing down the said pipe to the space between the cleaners. The top cleaner is a fixture to the pipe, and is driven by means of a bevel wheel on the pipe gearing with a similar wheel on the driving shaft of the machine. The bottom cleaner is carried on the upper end of a vertical shaft, which is driven by bevel gearing from a horizontal shaft deriving its motion by a belt or strap

from the driving shaft. The tin-plate to be cleaned is inserted between the top and bottom cleaners, the rotary motion of which in reverse directions causes the bran to effectually clean the plate. The cleaned plate is carried out of the machine by a pair of rolls, the upper one of which (or it might be the lower) is driven by a strap from the driving shaft, and the lower one by a toothed gearing from the upper. The whole of the parts are carried by a suitable frame provided with feed and delivery platforms or boards for the plates, and also feed and delivery rollers if thought desirable.

THE METALLURGICAL TREATMENT OF OXIDISABLE MINERALS.

At the Society of Arts on May 2 the discussion of Mr. Hollway's paper on A New Process of Metallurgy, read Feb. 12, was resumed.

The CHAIRMAN, in calling on Mr. Hollway to open the renewed discussion, said that on the last occasion Mr. Hollway had stated the principle of his process. A portion of the evidence then brought forward was experimental, and a portion theoretical. The experimental part of his statement consisted of details of experiments carried on at Penistone up to January last, when very large quantities of pyrites were oxidised in a large Bessemer converter, proving that the heat evolved by the combustion of a portion of the sulphides was sufficient to fuse and keep in a molten state the whole of the solid matter, which amounted to many tons, added from time to time. The question of the quantity of sulphur thus burnt was one which Mr. Hollway had not determined exactly experimentally, although he had ascertained that the air issuing from the mouth of the converter was free from oxygen, showing that sulphur was present in the uncombined condition. He also brought forward other evidence—the fact that a bar of wrought-iron was rapidly melted in the gases issuing from the converter at a temperature which, measured by a Siemens pyrometer, was much below that needed for the fusing of wrought-iron; the fusion being caused by the union of the sulphur present in the state of vapour with the iron, so as to form sulphide of iron, which rapidly fused. Since then Mr. Hollway had made experiments on the possibility of collecting sulphur in quantity, and the points for discussion now were the question of the lining which he proposed to employ; in the second place, the question how far it was proved practically possible to carry this oxidation of the sulphides on in a continuous fashion; thirdly, there was the important question of the copper contained in the regulus. He would, therefore, call on Mr. Hollway to state the results of his recent experiments on these points.

Mr. JOHN HOLLWAY said—Two and a half months have now elapsed since I had the privilege of bringing my process for the metallurgical treatment of oxidisable minerals under your kind consideration. I then endeavoured to point out to you that the great principle upon which the process depended is the burning of mineral sulphides, notably that of iron, in such a manner that it is possible, by the aid of the high temperature thus obtained, to fuse, decompose, and flux the substances present in the molten bath, thereby producing a slag containing the non-valuable and a regulus containing the valuable constituents of the said ores, together with metalliferous sublimates and crude sulphur. The magnitude of the operation and the difficulties which surround experimental work of this nature render somewhat tedious investigations undertaken without the advantages of specially constructed plant. After abandoning the use of Bessemer plant, which, with its costly hydraulic gear, has been a serious obstacle to some practical minds—although it served admirably to illustrate the first principles of the process—it was necessary to construct or modify a furnace in such a manner that a current of air could be forced through molten material lying on its hearth. A spiegel-melting cupola was the first furnace used in these experiments. It was fitted with tuvere boxes on each side at the bottom; three Bessemer tuyeres of 13 holes each, having a diameter of 5-16 inch, were used to introduce the air current into the molten sulphides. At the back of the cupola a forepart was built of firebrick 4 ft. high. This forepart was connected with the cupola by an aperture in the side of the latter about 20 in. high, in order that molten material undergoing oxidation on the cupola hearth might freely communicate with a quiescent hearth, where it was hoped a separation of slag from regulus would take place. The slag produced had to rise up to the top of the fore-part, leaving the furnace at the upper slag hole in a continuous stream. The regulus was to be tapped out of the fore-part. The cupola was connected by flues with two condensing cupolas to retain the sublimates, but much sulphur burnt at the top and slag tap-hole of the blowing cupola. An experiment was made with this apparatus on the night of March 27. The furnace made hot with coke was charged with pyrites mixed with coke in order to procure a molten bath of protosulphides. After one or two hours the coke was discontinued, and pyrites was added with one fifth of its weight of sandstone; the fusion went on rapidly. The contents of the furnace being intensely hot and liquid, the slag rising in the fore-part as anticipated, at length began to pour from the upper slag hole, which had been left open during the operation; a long flame of burning sulphur issued from this hole until it was stopped by the rising slag, causing considerable inconvenience. While the temperature was thus gradually rising in the cupola the stream of slag was observed to increase suddenly, and presently it rose with force, partly lifting the top of the fore-part; it then came over in a torrent beyond control, and flowed on to the floor of the cupola stage, where it soon cooled. Several tons of matter were thus ejected, leaving the furnace almost empty. The experiment was not continued further, as the molten bath of material had thus disappeared. The tap-hole of the forepart was then opened, and some regulus was tapped out. As the operation had not proceeded long enough to produce a concentrated regulus, the percentage of copper was known to be low, the matt actually containing 7 per cent.: 5 or 6 tons of pyrites were used in the experiment. The slag ejected was carefully examined, and no shots of regulus could be detected by the eye in it. Assays gave 0·5 per cent. and 0·6 per cent. of copper present, which copper metallurgists inform me is very slow for a slag of the high density of that produced. It was very satisfactory to observe how readily the regulus parted from the slag under the conditions of perfect fluidity which prevailed in this experiment. The percentage of copper which the slag retained was probably natural to any slag of such high density; a large amount of the copper present was lost in this slag. The pyrites contained 1·7 per cent. of copper, and the slag formed amounts to about 0·8 of the pyrites used; this gives a loss of ·48 per cent. out of 1·7 per cent. of copper present, or 25 per cent. That there is considerable difficulty in starting the operation will be readily understood. If the sulphides above the tuyeres once get overblown, the mass is almost certain to refrigerate before oxidisable matter arrives at the hearth. If, again, pyrites is introduced too rapidly before a sufficiently high temperature has been developed in the liquid mass, the temperature of the latter is greatly reduced by the volatilisation of sulphur and the fusing of the sulphide of iron. The proper slope for the boshes, the capacity and height of the crucible, the amount of air introduced, the best fluxing materials that could be added, and what quantity of them would be conveniently fused by the heat developed by the oxidation, the rate of introducing the charge—these were all unknown data, the correct mutual relations of which determine the success of the operation. A larger cupola was next fitted with a tuyere hearth, the tuyeres being set in a horizontal iron plate; this furnace was fitted with a self-closing hopper, and was connected by means of flues to three other cupolas to condense the volatilised sulphur and sublimates. Spray jets of water were arranged in these cupolas; the water was finally run off into a tank. A forepart was again built similar to the last, but somewhat higher. On the evening of April 8 the furnace was heated as before, and after 2 or 3 tons of pyrites had been charged the operation was continued without the use of carbonaceous fuel. For three hours pyrites and sandstone were continually charged into the furnace; a great flame, 8 or 10 ft. long, of incandescent vapour burnt at the upper slag hole, causing a considerable loss of sulphur. The pyrites was put into the furnace at the rate of 3 tons per hour; in the last hour rather more than this quantity was introduced; the pressure of blast was from 10 to 15 lbs. per square inch. At last the slag reached the upper tap-hole of the forepart very hot and liquid, and poured in a thin stream on to the ground below. The flow of molten matter rapidly increased; in a few moments the stream was a foot in diameter. It was universally agreed by those present that this slag was far above the temperature at which the operation could be carried on, and that a considerable amount of earthy fluxes would easily have been fused if present. The flow of slag now suddenly became violent, lifting the cover of the forepart, it came over in a torrent, and 3 or 4 tons of liquid matter were ejected in the course of a minute. The cupola thus nearly emptied itself, and the operation was at an end. Only three minutes elapsed between the time that the slag began to flow rapidly and the final eruption. During the experiment fumes of sulphur vapour were forced through the brickwork of the first flue leading from the blowing cupola to the first condensing cupola. The gas in it must have been under considerable pressure; the heavy iron lid of the latter cupola was lifted by the pressure in it. Much steam was here generated by the evaporation of the water used to condense the sulphur; at the lower exit of this cupola sulphur was found, which had evidently undergone fusion, showing that the temperature had been above 115° C. When the next morning the first condensing cupola was opened, a large heap of crude sulphur was found lying on the floor, and the sides were thickly coated with it. The quantity collected was 20 cwts., besides some which had been deposited from the water in the tanks. This, it was evident, could only be a fraction of that obtainable by the use of more perfect means of condensation, and by preventing the escape of incandescent vapour from the tap holes and connections of the blast furnace. The slag produced contained, as before, 0·5 per cent. of copper. As the object of this experiment was mainly to show qualitatively that large quantities of sulphur could be collected, no attempt had been made to introduce other fluxing materials than the silica necessary to take up the protoxide of iron formed. The regulus produced contained 11 per cent. of copper. The cause of the eruption in both experiments has been a subject of much conjecture. It is certain that the molten matter lying over the tuyeres in the cupola was displaced by an accumulation of gas above its surface, which could not find free exit through the channels prepared for it. As has been already noticed, there was undoubtedly a considerable pressure exerted in the second cupola and along the flue leading to it. The accumulation of sulphur upon the floor of the second cupola must have impeded the free passage of the gas, which had blown it aside to secure itself an outlet. Large volumes of steam were produced in the cupola, but, on the other hand, the volume of the heated gases was greatly diminished by the fall of temperature they here experienced. Mr. J. F. Allen ascribes the accident to three principal causes—1st, that the charge boiled and spurted so that it partially closed the flue leading to the second cupola (certainly some slag was found in this flue which had been thrown up from the bath, but not enough to contract the size of the exit very materially); 2nd, the sulphur found in the second cupola, which nearly closed the flue leading to it; and 3rd, the pressure of hot gas and steam. When the cupola was opened unfused matter was found lying near the hearth, mostly roasted pyrites. This principally consisted of the charge that had been added after the eruption of slag had taken place, for the heat was then insufficient to fuse solid material. It would, probably, be advantageous to introduce the pyrites into the furnace with a flux which contained in itself sufficient basic material to make a fusible silicate with which the protosulphide undergoing oxidation would readily mix, so that the particles of protoxide of iron formed might be brought into more perfect contact with the silica with which it must ultimately combine; under other circumstances the sandstone or siliceous rock added must remain solid until silicate of iron is formed, which must take an appreciable time. This solid material lying near the surface of the protosulphides must necessarily tend to produce a scaffold, particularly if the surface is chilled by the too rapid addition of raw pyrites. The lining of gannister was not materially injured by the experiment. As 7 or 8 tons of slag was produced, 2½ tons of silica were required to saturate the oxide of iron formed, and nearly this quantity was introduced with the charge. The hot gases escaping in the experiments described were not utilised to heat the charge introduced, which consequently arrived at the lower part of the furnace in the cold state, but I think this will not be found difficult to effect in a furnace of proper construction. Three experiments have since been made with the same cupola, two of which have not given the results anticipated, on account of the difficulty of getting a bath of molten sulphide with which to start the operation, this was due to accidental circumstances. The mass set in the hearth before the coke was burnt away; this coke, lying in contact with pyrites at a red heat would give rise to much bisulphide of carbon, thus decreasing the temperature of the mass. The coke, also, being mostly at the top of the molten slag and sulphides, which had collected over the tuyeres, would not itself burn until free oxygen passed through the liquid below it. These difficulties can be avoided by starting the operation with a supply of molten sulphides from an ordinary cupola. The third experiment, which was proceeding favourably, came to a premature end by the escape of the molten matt from the cupola, owing to the lifting of the Bessemer bottom by the generation of steam from the partially dried gannister rammed round the tuyeres. These experiments were delayed by the Easter holidays, and only terminated at 4 A.M. to-day. They suffered in many ways from the haste with which these preparations were made, arising from a desire to place the results before this meeting. I am satisfied, however, in having obtained free sulphur and a slag, containing only ·04 per cent. of copper; and as our Chairman, and others here to-night, assisted at previous experiments, I think they will endorse my statement that the rapid oxidation of protosulphide of iron will produce sufficient heat to fuse 6 cwts. of incombustible material to each ton of pyrites operated on, which is the quantity of silica and bases necessary to produce a slag of the same composition as the sample on the table, which contains less than ·1 per cent. of copper; its specific gravity is 3·6. I wish to offer my best thanks to the managing directors of John Brown and Co. for the facilities they have kindly afforded me in making these experiments, and also to their managers for their most valuable assistance.

The CHAIRMAN said there was a gentleman present whose name was well known in connection with linings used for metallurgical processes. They had all heard of his labour in the Cleveland district, and how by the use of lime linings for Bessemer converters it had been found possible to obtain steel from iron which contained phosphorus. He would, therefore, call on Mr. Thomas to give his opinion as to the advantage or disadvantage of his lining for this process, or whether he thought it would be necessary to employ a basic lining.

Mr. THOMAS said he had had some experience with lime linings and with siliceous linings for converters, and did not consider the former to be suitable linings for these experiments. It might stand very well for a time, but, on the whole, silicious linings under proper conditions would stand better. He thought the best lining for this process would be ordinary silicate brick lining. The Dowlais converters were now lined with silica bricks, which were found to stand much better, and to afford greater facilities for repair. Therefore, notwithstanding any partiality he might himself entertain for lime linings he thought silica was the best for these experiments, and that in face of all the obstacles which might have to be encountered they would be found to stand very well.

Mr. ARTHUR COOPER, manager of the Bessemer works of Messrs. Brown, Bailey, and Dixon, had had some experience with gannister linings for Bessemer converters, and had found it a very simple form of lining, and that any attacks upon it by the oxides of iron were easily repaired. He had had no experience, beyond Mr. Hollway's few experiments, with the material in question, but he could certainly support what Mr. Thomas had said, and thought that by the addition of a sufficient quantity of silica to the pyrites intended to be treated, the gannister lining would answer exceedingly well.

The CHAIRMAN invited further remarks on the linings, as the economical working of the process depended largely upon whether they would have to be frequently renewed.

Mr. FRENCH said as far as he had had opportunities of judging, the siliceous lining had given varying results; but even if the material should fail in some respects, there was no risk of the lining disappearing so rapidly as to create an objection to the process. Even if it should fail there were other modes of dealing with the linings, such as having a minute water spray in quantity only sufficient to trickle over the walls. In that way the process could be continued, not only for days, but for weeks. Again with regard to the hearth, which had hitherto been made of rammed gannister, if that should be found to become rapidly corroded, a very good mixture for use in smelting copper would be a compound of sifted coke dust and fire-clay sufficiently damped. Two layers of it one about 8 in. and the other about 12 in. deep, rammed well down and allowed sufficient time to dry, would resist for a very long period the action of the copper regulus at a very high temperature. In his experience, one furnace had gone five weeks before being stopped, and the hearth was found to be entire at the end of 15 weeks. Peroxide of iron was also found present, and there appeared to be from 40 to 50 per cent. of copper regulus, though when tested there was found to be only from 14 to 17 per cent. of raw ore. He had found that hearths of that description lasted very well indeed. Of course, in this way the carbon prevented the oxidised iron from attacking the clay. He had also had fire-bricks made of 2 parts of clay to 1 of coke dust, but not with such good results. The blast had more action upon the bricks than the regulus had upon this mixture at the bottom of the furnace.

The Chairman requested Mr. Hollway to explain the experiments recently made in Sheffield, for the purpose of proving that a continuous working of the process was possible, and whether they had shown that the sulphur could be collected in large quantities.

Mr. HOLLWAY read the portion of his paper referring to the matter, and explained the drawings of the four cupolas placed at his disposal by Messrs. John Brown and Company.

The CHAIRMAN remarked that Mr. Hollway had not stated the exact quantity of sulphur to be obtained from (say) a ton of pyrites; whether one or more than one, atom of sulphur for every molecule of pyrites could be obtained?

Mr. HOLLWAY said the experiment was not quantitative, but there was abundant evidence to show that sulphur was evolved, and could be collected in large quantities.

The CHAIRMAN invited remarks from Mr. France, the manager of Messrs. Chance's works at Birmingham, to which some of the sulphur collected by Mr. Hollway had been sent to be refined.

Mr. FRANCE had received many hundredweights of the raw material from Sheffield, and found that it contained, by the refining analysis, 47 per cent. of sulphur, 24 per cent. of siliceous materials, and 28 per cent. of iron, reckoned as oxide of iron. It also contained about 1 per cent. of arsenic, and an appreciable quantity of copper, lead, and zinc, the quantities of which were not determined for want of time. The black material was first subjected to distillation as practised in Sicily; the material was placed in closed iron retorts and distilled into brick chambers. Sulphur was rapidly evolved, and was collected and compressed in the form of a brick. He succeeded in getting rid of the arsenic to a certain extent, but could not quite free the sulphur from it. In his opinion, the sulphur itself would never be available as pure sulphur, and would not be a marketable article as free from arsenic, of which it would still contain a very appreciable quantity. The material itself, however, burned with the greatest freedom, and the whole of the sulphur, down to 1 per cent. was burned out very rapidly, but he thought the material should be sold as collected. From the experiments at Sheffield a much richer raw material to burn than the copper pyrites, now so largely used, could, with more suitable means, be recovered, and one which would find a ready sale among acid makers. He produced a small specimen of the sulphur obtained in the fractional distillation, and explained that the skin on the top of it consisted almost entirely of sulphide of arsenic, the under part being sulphur, but not sufficiently free from arsenic to be sold as pure sulphur.

Mr. ALLEN, of Sheffield, said that what had been already done was satisfactory evidence that a large proportion of sulphur in a free state was obtainable by the process, even when worked under very unfavourable conditions. On the last occasion, an eminent metallurgist refused to believe that it could be so obtained, and another gentleman asked whether a single atom of sulphur had ever been collected, though it was a matter of discussion whether he meant a single particle or an atom of sulphur in a chemical sense. With respect to the actual production of sulphur, he had seen it obtained and it was, in fact, the enormous heap of black sulphurous material produced at the bottom of the cupola which had caused the accident referred to by Mr. Hollway. Of course such an accident as that would spoil any experiment, but when they remembered that the pyrites was melted down by means of the coke, and that it was only when the coke had burnt away that the top of the cupola was closed and the sulphur collected, they could see that nothing like a quantitative result was possible. But even by that rough experiment 40 or 50 per cent. of free sulphur had been obtained, the rest being siliceous iron; and the material could be entirely separated if some proper condensing apparatus were interpolated between the actual apparatus and the chambers for collecting the sulphur, so that in practice they might expect to get a far greater quantity. It was also an interesting fact that about one-third of its weight was extractable by bisulphide of carbon, because it was well known that plastic sulphur was not soluble in bisulphide of carbon, but gradually changed back to the ordinary modification, so that, by obtaining a solution of it in bisulphide of carbon it could be effectually separated from arsenic or any other impurity. The lead in it was only 1 per cent., which was not a very large amount. As to the quantity of the sulphur obtainable, they must not try to "kill the goose which lays the golden eggs." A good deal of the heat was obtained from the combustion of the sulphur, and in practice an equal amount of heat was obtained from its combustion as by the combustion of the iron. Of course it was evident from that that the more sulphur distilled off the less amount of heat would be obtained, so that they could not expect to go too far, though it was a matter of scientific interest whether the iron was not more readily oxidised than the sulphur. Unfortunately, the apparatus at their disposal did not allow any quantitative experiments to be made, but it had certainly been shown that a large quantity of sulphur was obtainable. In fact, the ore could be "cooked in its own grease," and that was a very satisfactory state of things. The experiment went on for several hours after all the coke had been burned away, and it at last came to a premature conclusion, because the mass of sulphur choked up the gas outlet, and caused it to blow out the liquid contents of the converter.

Mr. COOPER had been present on April 8, when the plant shown on the drawings was employed, and was much struck with the great amount of heat developed. Although he had formerly been of opinion that it would not be practicable to carry out the process continuously, he had rather altered his views on the matter, and now thought that, with properly constructed plant, and after the difficulty of charging the apparatus so that the demand should be equal to the supply, and the supply to the demand, had been overcome in practice, satisfactory results would follow. Ten tons of pyrites were treated on that occasion, and if the experiment had not come to an end by the emptying of the hearth, from the causes explained by Mr. Hollway, he did not see why it should not have been carried on to a very much greater extent. Upon that point he would remark that the lifting of the slag into the culvert, thereby narrowing the orifice, was not so remarkable, because, in the ordinary iron cupolas, where the distance from the tuyeres to the charging hole was not greater than that from the tuyeres to the mouth of the culvert, as in this case he had seen the slag thrown out of the hole with much less pressure than had been employed in that experiment—4½ lbs. to 5 lbs. a blast. This could be remedied by some arrrangement for drawing out the sulphurous formation, and these difficulties might be satisfactorily overcome. The difficulty of getting a bath to start with, might be very easily overcome by melting a sufficient charge to form an initial bath in the adjoining cupola, and then running it into the furnace. With reference to the three last experiments which Mr. Hollway had referred to, he was of opinion that the object was to a very great extent gained, the proportion of copper in the slags showing ·04 and ·19. The first experiment had proved conclusively, as Mr. Allen had stated, that the sulphur could be collected in a free state. Although an amount of ingenuity had been displayed by Mr. Hollway in the adaptation of the apparatus to his process, it must appear to all who had seen it to be of a very rude description; but when they remembered the numerous accidents which had taken place in the working of the Bessemer process after so many years experience with special machinery adapted for it, they would admit that Mr. Hollway had good reason to congratulate himself on the results of the experiments made with his extemporised apparatus.

Mr. DANIEL (from Messrs. Fowler, Leeds) said Mr. Hollway had asked him to estimate the cost of the plant required to treat about 12,000 tons of pyrites per annum by this process. He had simply gone into the question of the blowing engines necessary, and the quantity of coal they would consume. From the experiments so far made, however, he thought that the plant was still in a state which made it impossible to estimate the cost of it, as it was not yet known what the plant actually would be. But to treat 12,000 tons of pyrites per annum, taking 1·6 tons of air per ton of pyrites, would require a blowing engine with a cylinder of 25 in. diameter, and the total cost of that engine, with the necessary boilers, would be about 900*l*. The consumption of fuel would be about 850 tons, to supply steam for producing the amount of air necessary for the purpose.

The CHAIRMAN supposed that Mr. Daniel had given his estimate as an addition to that which had been made by Mr Howson on the last occasion, giving the particulars of the cost of plant for working on a very considerable scale, the figures of which appeared in the paper.

Mr. DANIEL explained that his estimate did not include any of the extra plant which Mr. Howson specified in his estimate, because that would not be necessary for working on a small scale.

Mr. HOLLWAY said the question was what would be the consumption of air, looking at the quantity of pyrites to be treated. Mr Howson's estimate included complete copper works on a large scale, whereas Mr. Daniels' simply included apparatus for converting copper ore into regulus in smaller quantities.

Mr. BELL, of Sheffield, said that at the last meeting, prior to the experiments, he had noticed that several gentlemen threw doubt upon the possibility of getting sulphur from iron pyrites. They all knew that it was possible, because they had seen it done long before Mr. Hollway introduced his process in the roasting of iron pyrites in Germany, in Hungary, and in many other countries, where iron pyrites was roasted in open piles in quantities as large as 600 tons at a time, whereby the extra atom of sulphur distilled off, and the sulphur was collected by making wells in the piles. The sulphur was then ladled out into moulds, and the ordinary rolls of sulphur were obtained. There was an old story, which appeared in Punch, of an inventor who made a stove that would save 50 per cent. in the coal required, and an Irishman proposing to buy two of the stoves so that he might save the whole of his fuel; he must confess that he had himself conducted an experiment upon that principle. He had thought that possibly the heat generated in the zone of combustion might cause the whole of the sulphur to distil off into the chambers when the iron came down into the zone of fusion, and, of course, there would be only the iron left, and the whole of the oxygen would have combined with the whole of the sulphur. Consequently he tried to imitate Mr. Hollway's process as near as he could, by using a combustion tube in an ordinary furnace in connection with an aspirator. In one end he placed pyrites, and in the other charcoal. Heat enough was then applied to the charcoal to form carbonic oxide and carbonic acid, not exactly in the same conditions as they would be obtained by Mr. Hollway's process, but under parallel conditions, inasmuch as there would be a reducing atmosphere. Having obtained that, he applied it to the pyrites, so as to raise the temperature, and found that the extra atom of the sulphur, indeed pretty well the whole of it, distilled off, not only as to nearly fill up his tube, but so that he obtained a large quantity of free sulphur.

Mr. GALBRAITH thought one part of the subject had not been noticed. It was well known that iron pyrites consisted of one atom of iron and two atoms of sulphur, and that by heating it in a closed furnace or in a closed vessel, as described by Mr. Bell, they would get one atom of the sulphur driven off as sulphur. That amounted to something like 25 per cent. of the pyrites. There was no doubt that that amount could be got as sulphur, but the astonishing element in Mr. Hollway's process was that on heating the iron pyrites, with one atom of the sulphur driven out and one atom left behind, when that was put into the converter, as was done in the experiments, and the air blown through it, it was found that at the mouth of the converter there was an enormous quantity of sulphur burning, and, of course, if it were not for the air that would have deposited as sublimated sulphur. There appeared to be evidence that protosulphide of iron did exist, not at low but at high temperatures. In Mr. Hollway's original paper the figures given of the regulus were that it contained 57 per cent. of iron, and of copper 15·85, while the sulphur was 21·96, and the silica only 2 per cent. Those reguli almost theoretically corresponded with the formulæ $Cu^2\,S$, $Fe^2\,S$. Thus, lower sulphide of iron must have existed at the higher temperatures. The point he wished to draw attention to was that with regard to this lower sulphide of iron many experiments had been made to form it, but it was found that it did not exist at low temperatures. Probably, however, it did exist, but it formed protosulphide of iron and metallic iron corresponding to the formulæ $Cu^2\,S$, $Fe\,S$, and Fe. That was a very important point with regard to the extraction of sulphur, because otherwise more than ths first atom could not possibly be got; it had also a very important bearing upon the metallurgy of nickel and copper.

Mr. GREENWAY said with regard to the residue after distillation of the first portion of the sulphur that the sulphide of iron remained behind the sulphuric acid, going off as sulphuretted hydrogen, showing that one atom of the sulphur had gone off, leaving only sulphide of iron behind it. There was no doubt, therefore, that it was possible to recover nearly the whole of the first atom of sulphur.

Mr. BELL had forgotten to mention that he had sulphide of iron left behind also, and that he had added hydrochloric acid and got off sulphuretted hydrogen.

Mr. STEAD, with reference to the sulphur question, said there was no doubt that since the last meeting Mr. Hollway had made a step in the right direction. Certainly, a considerable quantity of sulphur had been obtained; but it was ugly-looking black stuff, and not at all like sulphur, and any person would say that it was not, without putting it to a trial. It had been suggested that this material, containing only 47 per cent. of sulphur, could be advantageously imported from Spain without refinement; but there would be no advantage in doing that, because it was questionable whether any cost would be saved to the sulphuric acid manufacturer, as the amount of sulphur in the original pyrites was nearly the same. He thought it would be an easy matter to distill that sulphur without any extra cost of fuel. If the hot gases from the Bessemer furnace were taken into a stove containing a series of retorts, similar to those in a gashouse, taking the gas in at one side and passing it out at the other, the crude sulphur might be easily distilled off by the excess of heat from the combustion of the pyrites in the converter. That would be a decided advantage, and there would be no difficulty in effecting it, as the gases would be cooled by the distillation of the sulphur, and there would be less cooling and less condensing required in the next chamber. If that suggestion were adopted it would be another step gained. Since the last meeting also the slag had been materially improved by the larger quantity of the copper having been got rid of, which had been effected by the addition of lime. If it should eventually be proved that the addition of a considerable quantity of lime to a copper slag precipitated the copper from it, a discovery would have been made of the utmost importance to copper smelters.

The CHAIRMAN then invited discussion on the subject of the copper in the regulus produced by the process, and asked for a preliminary statement from Mr. Hollway on the point.

Mr. HOLLWAY said that Mr. Arnold heated some of the slag in a crucible at a high temperature, allowed it to remain for a long time, and found that no regulus was separated, which clearly indicated that the regulus was not entangled in it, unless it were so minutely that it could not be separated by heat. In the experiments at Sheffield they obtained a slag containing only ·04 per cent. of copper, and he held

that the process could easily be worked so as to leave no more than ·01 or ·02 per cent. of copper in the slag by making the specific gravity lighter, though perhaps there was also a chemical question connected with it—the presence of lime or similar bases in the slag.

Mr. COLLINS (Truro) said his experience had been more in the way of assaying than smelting, but he was somewhat familiar with the methods employed. With reference to the sulphur question, he thought the best way of treating the crude sulphur would be, not to dissolve one-third of it with bisulphide of carbon, but to treat it in a bath of chloride of calcium. He believed the process had been patented, and was in use in Sicily at the present time. It should be made of a proper density, to melt and float out the sulphur and leave the sulphide of arsenic at the bottom, the sulphur would then be perfectly free from arsenic. But this sulphur was only one of five products which Mr. Hollway got at one operation. On the first, the sulphurous anhydride, he had nothing to say; the second was the sulphur; then he had the slag; the mixed slag and regulus, and lastly the regulus. As to the slag, the specimen on the table was by far the most satisfactory which had been produced, but the experiments altogether were not quite satisfactory, inasmuch as this slag, poor in copper, was not accompanied by a regulus rich in copper. But going back to July, 1878, there was then a series of experiments, when slags were produced of a specific gravity of 4·11 and a regulus of an average specific gravity of 4·96; these experiments were on a very fair scale, and it seemed to him that, having regard to the slag and the regulus, they were by far the best made yet. The difference in the specific gravity of the slag and regulus being so small led to this fifth product, the mixed regulus and slag, which should be got rid of altogether. That seemed now to have been accomplished by the very obvious method of adding lime; the slag being thus lightened, the regulus subsided readily. He took with him from Sheffield some specimens of this mixed slag and regulus, had them cut, and examined them under the microscope, when he found in them a great many shots of perfect regulus; but if pounded up, and these were separated, the specific gravity was as nearly as possible what was shown in the table, 3·7. It was objected last time that if lime were used, or some similar material, to lighten the slag, it would be a waste product, not fit to be treated as an ore of iron; but since then Mr. Blair, who made the objection, had withdrawn it. Coming to the regulus itself, he found it contained something like 60 per cent. of copper, over 12 of iron, and 22 of sulphur, and it was impossible to look at these figures without seeing how nearly they approached to what copper smelters called "blue metal," or fine metal. He had a number of analyses of this material, and one, which he thought a fair average, was this:—72 or 73 per cent. of copper; iron, about 6·5; and sulphur, about 20. Mr. Hollway's regulus contained about 63 of copper, 13 of iron, and 22 of sulphur. Of course the analyses were not identical, but they were sufficiently near to satisfy him that Mr. Hollway, by his one process, had effected a very marvellous result, for this blue metal was only obtained in the Welsh copper smelting process from sulphurous ores by from four to six distinct roastings and smeltings, at great cost of fuel and labour. Mr. Hollway did it in one vessel, with very little labour, and with no fuel at all. If he could do nothing more than that the success of his process was assured.

The CHAIRMAN asked if Mr. Collins could give the particulars of the process for obtaining the sulphur, which, he said, was practised in Sicily. He was not aware that the Sicilian sulphur contained arsenic in sufficient quantity to render such a process necessary.

Mr. COLLINS said the process was carried out at the present time by Mr. Peter Le Neve Foster, son of the late Secretary of the Society. It was not used to get rid of arsenic, but because the sulphur was mixed up with a great deal of rock, and it was a convenient mode of separating it without loss.

Mr. TERRELL (Swansea) said he should speak from one special point of view—how far was this process adapted for treating copper ores; or rather, how far might the ordinary Welsh method of smelting copper be replaced by a new process based on Mr. Hollway's invention. He believed this process could be applied with advantage in conjunction with the smelting of ordinary sulphur copper ores, for the following reasons:—Pyrites and protosulphide of iron were both intimately connected with copper smelting as now conducted, but the sulphur was nearly always wasted. It was neither used to produce heat by its oxidation, nor was the product of its combination used for making sulphuric acid to any great extent. The reason why the heat produced was not available was because the oxidation was so slow that there was not a sufficient amount of calorific intensity produced to do any work; whereas in this process he was satisfied, from what he saw at Sheffield, that more than enough heat was produced, not only to melt the slag immediately connected with the sulphides, but also to melt certain quantities of other ores, such as were usually used contained material which, together with the silicate of iron, would form a still more fusible mixture than that alone, and at the same time form a slag of less specific gravity. He referred to such gangues as silicate of magnesia &c. He was satisfied that the process could be carried on continuously so long as the lining of the furnace would stand, that it could be carried on rapidly, and that much larger quantities of ore could be charged than in an ordinary reverberatory furnace. Again, in various parts of the world where fuel was scarce ores poor in copper and rich in sulphur could be concentrated into a regulus which might profitably be imported into this country. The very rich pyritous ores containing little copper would serve as fuel, which would be sufficient to melt certain quantities of carbonate ores and other oxidised ores of copper, and so get more copper into the regulus without additional blowing through the regulus itself to enrich it. He could say little about the separation of the sulphur, but whatever could be done in that way would add to the value of the process. He made his estimate of it simply on the basis of the Welsh method of copper smelting, wherein neither the excess of sulphur of the iron pyrites nor the sulphur dioxide produced were utilised, but were allowed to poison the atmosphere and kill vegetation; he would not say anything about human life, for he himself had certainly not suffered from it. Any present idea as to the form of the apparatus would probably have to be modified by experience, but if they once had the principle correct there was plenty of mechanical skill in the country to devise the requisite apparatus. He must say he did not quite see the analogy between the percentages Mr. Collins had quoted.

Mr. COLLINS having repeated the figures before stated, said he thought the invention would be better left in Mr. Hollway's hands, rather than handed over to the copper smelters, as suggested by Mr. Terrell. Great improvements generally came from outside.

Mr. HOLLWAY remarked that he had already received assistance from the copper trade, and he trusted he should have further help hereafter.

Mr. HEYWOOD (Cardiff) thought it must be admitted that Mr. Hollway's experiments had proved to a certain extent a success, and great credit was due to him for it. With reference to the sulphur, he was present at the experiments carried on at the Atlas Works, and he understood that some of the sulphur product was roughly analysed at the works, and found to contain only 4 or 5 per cent. of residuum. It would, therefore, be impossible for that sample to contain the enormous quantity of from 30 to 40 per cent. of iron, silica, and zinc which had been represented; and if any portion of sulphur did really contain 5 per cent. residuum, it would be quite impossible to obtain a large quantity; in fact, the whole of it contained no more than 5 per cent. As Mr. Allen had remarked, sand would naturally occur from the apparatus employed, the pyrites would disintegrate to some extent, and the coke would be blown over, and therefore there would be more residuum than would be obtained in actual practice. In Mr. Hollway's former paper, there were analyses of a slag, giving the average of the copper at ·15, and no doubt it was of great importance that slag should contain no greater percentage at any rate than that produced by the Swansea method. If the present slag was one which could be relied upon, in his opinion the success of the experiment had been thoroughly shown.

Mr. CLEMENTS suggested that this process might be adopted in Spain for the treatment of the Rio Tinto ore, and the regulus imported into this country, instead of the pyrites. The sulphur could also be used there for making sulphuric acid, which, if there were railway communication, might be advantageously used in the treatment of the phosphorite deposits of Estramadura, thus producing superphosphate, which was so valuable in agriculture.

The CHAIRMAN said Mr. Hollway had received a letter from a gentleman at the Salt Lake City, the manager of a mining and smelting company there, where it appeared that the fame of this process had already spread. In that district there were large deposits of pyrites, and being sparsely populated this process could easily be adopted, and the sulphur need not be condensed. He understood that Mr. Longmaid, who was present, had been in the district himself, and could give some information.

Mr. LONGMAID said he was not in any way connected with Mr. Hollway, but he had been to see the experiments at the instance of Mr. Holden, of Utah, with a view of introducing the process into America. He was connected with the largest silver-lead mining property in Utah, and beneath the oxidised ores which lay near the surface there were vast deposits of iron pyrites, containing besides silver and gold; many of them contained from 8 to 20 ozs. of silver, and ¼ to ½ oz. of gold, mixed also with a certain percentage of lead and galena. They had been to some extent roasted to volatilise the sulphur, and then smelted with coke as a flux with lead ores. But the process was very expensive, owing to the cost of labour and fuel, and therefore the great bulk of the pyrites would not pay for the operation. He had been to Sheffield and seen the experiments, and was perfectly surprised to find the intense heat evolved by the combustion of the pyrites. He must say that in his opinion no heat whatever was evolved from the volatilisation of sulphur. He thought the metallic iron was the source of the heat, and that the combustion was so intense that the sulphur could not combine with the oxygen in the presence of iron at that temperature, but he scarcely liked to hazard that opinion among so many scientific men. It was not only in Utah that there were such vast deposits of pyrites. It also occurred in all the Western States, especially Colorado. In Nevada there were large quantities, and some mines produced ore of very high quality, but which could not be used at all on account of the expense of fuel. By this process he believed those ores could be treated. With reference to the linings, he thought the difficulty might be easily got over where aluminous or siliceous linings were used by covering the furnaces on the exterior with water-jackets, so as to keep the linings always at a temperature below the point of combination of silica and iron. They would be further preserved by smelting with siliceous slags instead of basic slags. On the subject of slags carrying a matt, his experience in lead smelting showed that a very large proportion of sulphide of iron and copper would be carried into the slag by making very basic slags; in fact, in lead smelting with from 8 to 10 per cent. of sulphur they would carry the whole of it into the slag with the quantity of iron and zinc necessary to form sulphides. It was a mere matter of calculation to produce slags which would not carry any matt. In conclusion, he had only to say that in about two weeks, if he could make arrangements with Mr. Hollway, he intended to return to Utah to put the process into practical operation.

The CHAIRMAN said the last announcement was a most practical one. The people of Utah were very energetic, and no doubt they would soon hear of the process being at work. There were large deposits of pyrites not only in the United States, but in other parts of North America, and he believed Mr. Thompson could speak as to the deposits in Canada.

Mr. THOMPSON said he could claim neither theoretical nor practical knowledge of metallurgy, but he left America six weeks ago for the purpose of making arrangements for carrying out this process. Without detracting from Mr. Hollway, to whom all honour was due, but to show the value of this idea, he might mention that it was one which the necessities of the time had been bringing to the surface. Mr. Eustiss, of Boston, had commenced experimenting on the process about the same time as Mr. Hollway, and had been going on with it independently. Those experiments all tended to show the success of the idea and the value of it. There were in Canada certain large deposits of iron pyrites, carrying a comparatively small quantity of copper, very much resembling the Spanish deposits, and he was here for the purpose of making arrangements for the control of such works. His associates at home were at work on the ground making preparations for trying the process, and in another month or two he hoped to have a shipment of regulus on its way to Swansea, made by what they might call the Hollway process.

Mr. GALBRAITH wished to refer again for one moment to the sulphur question. Mr. Heywood said he had received a sample from Sheffield containing 4 per cent. of residue, and he had no doubt that such could be obtained, though he did not know that it had been yet. They found some samples contained 80 per cent. of sulphur, but the average contained 50 per cent. With regard to the slag and regulus question, the analysis placed before them showed ·01 per cent. of copper in the slag, and in one sample he had he was much surprised to find scarcely a trace of copper, considering that the experiment came to a sudden termination He picked up one piece himself in which there was rather more. Another piece contained ·19. The copper seemed to vary considerably, and this naturally raised the question how did the copper exist in the slag overlying the regulus? If it existed as a silicate, and was really combined with the regulus, it would not be expected to vary so much, but if it were merely suspended throughout the slag they could understand how it must vary, and on crushing it up fine and examining it he had found several traces of regulus if not of metallic copper. With regard to the separation of the regulus from the slag it was evident that if it were allowed more time it would have a better chance of settling out. In some experiments it was allowed to flow out and cool as best it could, and there was an immediate layer of mixed slag and regulus, so that hitherto the separation question had not had a fair chance. Another means would be to make the slag lighter, by introducing more lime. With regard to the starting of the process it was evident you must have a molten bath to commence with, because if you had a solid mass on the tuyeres you could not get the blast to work. The cupolas were heated up with coke, and gradually the pyrites was introduced; and as soon as it got melted it lay at the bottom, and consumed all the oxygen, so that the coke over it was not burned at all. If you introduced the pyrites too rapidly the volatilisation of the sulphur was too rapid, and would chill it, and under some circumstances, therefore, coke would not be a fuel at all. The difficulty was how to hit the mark exactly, so as to get a bath and burn the coke and keep up the heat. He did not think, however, that this difficulty would occur in working on a large scale.

Mr. ALLEN (Sheffield) wished to endorse what Mr. Galbraith had stated as to the variable quantity of copper in the slag, and also to mention that there had been certainly distinct specks of metallic copper in a sample of slag run from the slag hole. It was in a state of violent commotion immediately before, so that this was naturally to be expected. He thought it was quite possible to obtain such a sample of sulphur as Mr. Heywood mentioned. Mr. Collins had misunderstood him in saying that in his experiment one-third of the sulphur was dissolved out in bisulphide of carbon. He dissolved ·33 per cent. out of ·45 per cent. present.

Mr. STEAD thought the separation of copper from the slags was a matter simply of arranging the composition of the slag.

Mr. THOMPSON said with regard to the sulphur question he had extracted the sulphur by a process of this kind. One atom was burned off in the shape of sulphurous acid, and then, by forcing through the heated pyrites superheated steam, the other was carried off in the shape of sulphuretted hydrogen. The gases were taken into a separate chamber, and there mixed and precipitated, giving much more pure sulphur than was obtained in these experiments.

Mr. BELL said he had been in Colorado a considerable time, and he could endorse the remarks of Mr. Longmaid. There were plenty of siliceous ores there which would make an excellent flux. He went to the experiments on the 8th rather sceptical, but came away quite converted; he never saw a more liquid slag than came from the converter. He concluded that siliceous and sulphur ores could not only be mixed so as to get a good regulus, but that the furnace would even carry basic ores, of which there were many in Colorado—ores containing as much as 3000 ozs. of silver to the ton; those containing only 30 ozs. were not considered worth treating, but as soon as the sulphur could be utilised, they could be treated for silver and gold. With regard to the furnace itself, he thought the misfortunes which had occurred had not been due to any fault in the principle itself, but simply to over-feeding, and he would suggest that the charging should be made automatic. Where sulphur and iron were also used as fuel, only not at a pressure, you could then have a bath of molten metal, as in the hearth furnace used for smelting lead. He would suggest also that the blast should be finely divided, like an Argand burner, which would produce more heat; and instead of using a water space to carry away and waste the superfluous heat, that the furnace should be enclosed in a jacket, in which the air to be passed into the furnace should be carried, so as to utilise the waste heat to heat the air going into the furnace.

The CHAIRMAN, in closing the discussion, said the subject had now been very well ventilated, and as far as he could see the more it was ventilated the more satisfactory did the results appear. There had been a great number of practical men present who had spoken from experience, and he thought they must all be convinced that at any rate for the working of certain copper ores this process would be most important. Whether the whole of the sulphur could or could not be recovered seemed to him a matter of minor importance; sulphur was not so valuable a substance as copper, and though no doubt in situations where it was advisable and necessary the sulphur could be obtained, there were many places where it would be found more economical to allow it to go into the air, and he did not see why that should not be done. In conclusion, he proposed a vote of thanks to Mr. Hollway for his extremely valuable paper.

The motion having been carried, Mr. HOLLWAY, in reply, expressed his great obligation to Prof. Roscoe for his kindness in taking the chair, and for the great interest he had shown in the subject.

COMBUSTION WITHOUT SMOKE.

Apart from the disagreeable nuisance avoided by securing the combustion of fuel without smoke, it cannot be doubted that much of the black smoke seen issuing from the chimney stacks may be regarded as useful fuel going to waste—much of the carbon thus going off ought with care and judgment to be utilised in the production of heat. For this reason any invention for the prevention of smoke which has reasonable prospects of success should receive a fair trial. In the last Bulletin of the American Iron and Steel Association Dr. W. H. Wahl, of Philadelphia, describes an invention, of which Mr. G. W. Morrison is the patentee, which is claimed to have the great advantage in the generation of steam that a great saving of fuel is effected, and the formation of smoke absolutely prevented. The apparatus has been practically tested in one of the large manufactories of Philadelphia, and given complete satisfaction. Only anthracite waste coal, costing when delivered less than $1 per ton, is used, and its behaviour is in all respects equal to that of a like quantity of the best coal; combustion is perfect, and no gas is lost. The same results were obtained with $3 worth of coal waste as $12 worth of the round coal had previously given; that is, the power for a 150-horse power engine is furnished for 24 hours. Referring to the invention Dr. Wahl states that it is susceptible of demonstration that the best constructed engine that it has been possible to devise up to the present time will only yield a usual effect equivalent to from 10 to 15 per cent. of the duty which ought to be realised from the combustion of the fuel supplied to the steam generator. The principal causes of this enormous percentage of loss, as engineers are universally agreed, are readily traceable to imperfections in the mechanical construction and setting of the steam generator, difficult of remedy under existing systems of practice, and in consequence of which combustion is carried on at best but very imperfectly.

The all-important question of effecting a more perfect combustion does not appear to have received the attention it deserves. One of the most important requirements in promoting completeness of combustion is that the intermixture of the gases evolved from the burning fuel with atmospheric oxygen shall be perfect and intimate. Where the fuel is in a finely comminuted condition (coal or sawdust) the ordinary methods of combustion prove quite inadequate; special means must be provided to consume it, and peculiar devices must be made use of to insure the passage of the air through the fire-bed, and to effect its proper and intimate contact with the air. Such artifices and devices to effect more perfect combustion will be the best which can be most easily applied to existing steam generators, without requiring radical and expensive alterations, and which can be operated at the minimum of cost for attendance and repairs. On the top of the bridge wall of the ordinary horizontal steam-boiler furnace there is placed, according to the invention of Mr. MORRISON, a transverse pipe, provided with a number of perforations, preferably on the upper side only, and with this pipe communicates a horizontal pipe, contained in the flue at the rear of the bridge, the two pipes in question forming a T-shaped combination. A second pipe U-shaped traverses the flues at the rear of the bridge, its outer end being open to the atmosphere, and the other projecting into the leg of the T-pipe before mentioned. Within this leg likewise is placed a nozzle, directed toward the perforated cross-piece of the T-end, to which superheated steam may be conveyed by a suitable pipe. By suitable connections this steam pipe may be divided and made to deliver, by the device of a steam blower, an artificial blast of steam and air under the grate bars; commonly, however the inventor prefers to employ a fan. There are, it will be observed, no increase of grate surface, no perforations of the walls, and no radical or expensive changes of the boiler setting required. The volumes of partially burned gases generated in the fire-place (carbonic oxide, hydrogen, hydro-carbon, and other combustible gases) which under ordinary circumstances would suffer but most imperfect combustion in their passage through the remaining fire space of the boiler, and would be hence practically wasted, are in this case met at the bridge wall by the fierce jet of superheated steam and air delivered through the numerous perforations of the T-pipe, bringing the air, in the condition to produce the most intense combustion, into that intimate and perfect contact with the unconsumed furnace products, which, as we have before affirmed, is the essential element of a perfect combustion. The effectiveness of this simple contrivance is further demonstrated by the fact that the combustion of refuse fuels, such as coal dust, sawdust, spent tan, &c., can be carried on in ordinary furnaces supplied with the attachment, not only with a complete suppression of the smoke nuisance but with a degree of economy, as to steaming capacity per pound of fuel, surpassing that obtainable with the much more expensive fuels commonly employed for steaming purposes.

Meetings of Public Companies.

NATIONAL PROVINCIAL BANK OF ENGLAND.

The annual general meeting of proprietors was held at the head offices, Threadneedle-street, on Thursday,

Mr. RICHARD BLANEY WADE in the chair.

Mr. WILLIAM HOLT (one of the joint general managers) read the notice calling the meeting.

The CHAIRMAN said: Gentlemen, I think the best course for us to pursue this morning will be to take the balance-sheet in hand, and go through the various items on both sides of the accounts, and I will from time to time make such comments as I think necessary, in order that you may fully understand the position of the bank. We will begin with the liabilities. You will find that the first item is the paid-up capital—1,687,500*l.*, which is, of course, the same amount as that which it was last year. We next come to the amount due by the bank on deposits—25,930,793*l.* 7*s.* 8*d.*; this represents, of course, the amount due to our customers upon their credit balances, and also upon deposit receipts; and I may say roughly that the amount I have mentioned to you is pretty evenly divided between the two classes of depositers. You will find that this amount shows a reduction in the course of the year of about 1,300,000*l.*, but I not think you will consider that large when you take into consideration that during the past year the profits to be derived from trade and agriculture were small, and our customers were, consequently, the poorer for the time, also that in the autumn a considerable fall of securities took place, and very large investments were made on the part of depositors. Some portion, but not all, occurred from want of confidence in banking institutions. So far as we are able to trace, a considerable amount of that money has again been brought back to us. The next item is cash against Consols, as per contra, 573,000*l.*, in the inner column; that is the amount which we borrowed upon a portion of the securities of the company, thinking it better to take that course than to sell any more securities, although at the time, when the price of securities ruled very high, it was necessary, at the period we did that, that we should have an abundance of cash in hand to meet any emergency which might occur. That amount was repaid as soon as circumstances changed. The next item are the acceptances—840,288*l.* 9*s.* 11*d.*; this amount is somewhat larger than it was last year, but you will understand that that is a portion of our business which we have always desired to keep within moderate limits, and I may mention that the amount now under acceptance is lower than on Dec. 31 last. The reserve fund now amounts to 90,000*l.*, as it did this time last year, the whole of the amount being invested in Government securities. (Cheers). I will say a few words further upon the addition the reserve fund, and the amount standing to the credit of profit and loss, later on in our proceedings. We will now turn to the side representing the assets, which represent the total of 30,110,498*l.* 4*s.* 9*d.* And, first of all, you will find we have cash in hand, at Bank of England and branches, and at call and short notice, of 5,521,096*l.* 17*s.* 2*d.*; nearly the whole of that sum was at the Bank of England and at our branches—in fact, all of it except about 1,400,000*l.* which was with the brokers at short notice and at call, the whole of that amount of 1,400,000*l.* being covered by good and easily convertible securities. The next item, the sum of 3,798,821*l.* 12*s.* 4*d.*, represents the amount in the securities of the British Government. The sum of 2,343,500*l.* 7*s.* 10*d.* represents our investments in Indian and Colonial Government securities, and in first-class railway debentures and preference stock. You will observe that we do not hold any securities whatever in foreign Government stocks. (Cheers.) We next come to bills discounted, loans, &c., which amount to 17,063,908*l.* 7*s.* 3*d.*; it may be as well to mention to you the fact that this amount is always coming in, loans are paid off, and fresh advances made every day; we have no unmanageable sums which can never be called in, and we have no advances of such a character that we are afraid to face and are obliged to go on increasing the amount by making fresh advances. It is well you should know the greatest care is taken in making the advances. The application comes through the local manager, who collects all the necessary information, and reports to us upon each case; that report is confidentially and carefully sifted by our general managers, and then the directors decide whether the advance is to be made, when they are in a position to form an entirely independent judgment upon the question, entirely free from any local feelings. The amount of 840,288*l.* 9*s.* 11*s.* represents the securities which we hold as cover for the acceptances on the other side; but I may state that the amount which we do hold as a cover considerably exceeds that amount—in fact, at this particular time it exceeds 1,000,000*l.*, so we are amply covered for all the acceptances for which the bank's name is given. (Cheers.) Our last item refers to the freehold banking premises; now, that is an amount which has been sometimes misunderstood, although it really speaks for itself. It means this—that the total which we have expended upon buildings amount to 709,710*l.* 9*s.* 4*d.*; for that we have all our buildings, and we have also a depreciation fund, which amounts to 166,827*l.* 19*s.* 1*d.* As to the value of our premises it is not necessary for me to say much; I may remind you that we have included the splendid premises in which we are now assembled, and which alone would represent a very considerable portion of the amount of 542,882*l.* 10*s.* 3*d.* which you will find in the column. Also I may state that the premises which we possess at Newcastle, Birmingham, Manchester, and Bristol, and other large branches far exceed in value the amount at which they stand in our books. Now, gentlemen, I am afraid I have detained you a long time over these figures, but I thought it desirable, as I stated at starting, that you should know thoroughly the position which we occupy. We have presented to you to-day our balance-sheet very much in the same form as in previous years, for the attention of Parliament is now engaged as to the form of the balance sheet for banks, and we thought it better, until they decide the question, to leave the form of our balance-sheet very much as it has been in former periods. I will now, if you please, turn to the question of the distribution of the profits for the year. We propose to pay the same amount of bonus as we did this time last year, and that, with the other payment, will make a return of 21 per cent. upon the paid-up capital of the Bank. We also propose to place 30,000*l.* to the credit of the reserve, which will be at once invested in Government securities, and raise that fund to 930,000*l.*, which will leave us a balance of 30,791*l.* 7*s.* 2*d.* to carry to the new account of this year. Now, the year 1878, as far as the value of money was concerned, was favourable to banking operations, and it it had not been for the feeling of want of confidence which came over the community towards the close of the year our profits would have been considerably larger, but I need not tell you that the autumn and early winter months was a period of great anxiety to all those interested in banking. Since the formation of joint-stock banks no period of strain and trial can be compared to it, and it is very satisfactory to find that the joint-stock banks of this country, on the whole, passed through that severe ordeal in the most satisfactory manner. I except the case of the City of Glasgow Bank, because that was a case of an exceptional character. Then we have to lament the failure of one more bank—the West of England and South Wales Bank. And this seems a proper place in my remarks to bear testimony to the admirable manner in which our business has been conducted by our staff through a very trying period. At such a time zeal and energy, patience and self command, are qualities most essential. All those qualities were displayed by our staff at our various branches. Of course that feeling of want of confidence fell more severely upon the West of England and South Wales branches, and most admirably were the difficulties met by the gentlemen who represent us in those localities. But whether in London or the country, all did their best, and proved themselves to be true sons of the National Provincial Bank of England. (Cheers.) During that time the vigilance of the joint general managers, Mr. Holt, Mr. Fergusson, and Mr. Robinson, was unwearied. Early and late those gentlemen were at their posts, aiding us with their advice, and watching over the important interests committed to them with that energy and assiduity and ability for which they are so distinguished. (Cheers.) And now, gentlemen, it is a source of very great gratification to my colleagues and myself to announce to you that during the year which has just passed this bank has met with no loss other than such as ordinarily occur from year to year in the conduct of the large business. We can assure you that the position of the bank is in every way satisfactory. We have lost no money from the failure of the City of Glasgow Bank, or any of those commercial houses which were immediately connected with it; in fact, the only claim we have against the City of Glasgow Bank is for a sum not exceeding 700*l.*, which was the balance of the weekly account between the two institutions at the time of the failure. We have also to announce to you a very considerable accession of business; from one cause or another numerous accounts have been brought to us—accounts, I am happy to say, of a most satisfactory character. Indeed, at some of our branches so large has been the increase that we have had considerably to increase our staff at those particular branches. Now, this large increase of business has caused us to look seriously into the position of our capital account, and we have come to the conclusion that some moderate addition to the paid-up capital should be made. Since our last issue of new shares the deposits have increased between four and five millions. We have also taken over the business of a large joint-stock bank at Leeds, and we have received this important addition of business which I have mentioned in the West of England, therefore we propose to issue 28,125 shares of 20*l.* each at 10*l.* premium, and to call up 12*l.* per share. This call will be divided into six calls of 2*l.* each, beginning from next July, and the amount of premium of 10*l.* will be divided into five payments of 2*l.* each, which will be payable at the same time as

the first five calls. The result of this operation will be that in about 2½ years from July next our paid-up capital will be 2,025,000*l.*, and our reserve fund will stand at 1,211,250*l.*, the whole of which latter sum will be invested in Government securities. (Cheers.) But, in addition to what I have said, there is another reason why our capital should be increased. During the last few months the minds of shareholders have been much occupied with the liabilities attached to their shares. It is only natural this should be the case, and in consequence of that feeling we took an early opportunity of informing the Government that owing to what we believe an oversight in the Act of 1862, this, and companies like our own, who had already registered under that Act for certain purposes, were precluded from registering in such a manner as to limit their liability. A meeting took place recently of the London and country banks, and interviews have taken place with the Chancellor of the Exchequer, who was asked to bring in some measure covering that defect, and the result of it all is that a Bill has lately been introduced into Parliament, for which I think all shareholders in banks should feel extremely obliged to the Chancellor of the Exchequer for introducing. Upon the question of unlimited liability I must remark that in a well managed bank, such as ours, with a large paid up capital and reserve fund, there need be no fear about unlimited liability. At the same time we are ready to admit that some limitation is desirable for many reasons, and not the least is that there are a large and important class of persons who will become shareholders when such a measure is carried out, and who have hitherto remained aloof from institutions such as ours. We shall, of course, take steps in this matter—in fact, we could not do so without calling you together to consider the proposition we may make. Without some such increas of capital as we propose, it would be difficult when the time comes for us to carry this measure into effect. We shall, of course, consider the position of our customers, as well as of our shareholders, in any arrangement which we may make, and we shall take ample care that the customers of the bank shall receive very full security for the money which they leave in our hands. Gentlemen, I have now touched upon most of the points which I think may interest you, but there is one subject remaining, and that is to express the special regret of every member of this board at the loss we have sustained in the death of Mr. Alexander Robertson. For upwards of 43 years Mr. Robertson served the bank in various capacities; his interest in it remained unabated to the close, and within three or four days of his death he was in this room, taking part in the deliberations of the board. He has left us, followed by the sincere regret and kindly feelings of everyone who came in contact with him. As to the future, I have but little to say. I believe, in common with a great many others, that with cheap labour and cheap money, and with the raw materials which are used in our manufactures at a low price, the gloom which has so long hung over the trade and commerce of this country must soon pass away. When that may be of course it is impossible for me to say; but of one thing I feel confident, and that is that so long as the affairs of this great institution are guided by strict banking principles there will be a long future of progress and success in store for the National Provincial Bank of England. (Cheers.(I beg to move the adoption of the report and accounts.

Mr. J. O. HANSON seconded the resolution.

After a few remarks from Mr. REEVES and Sir EMILIUS BAYLEY, both of whom referred to the very gratifying character of the report, the resolution was put and carried.

The retiring directors—Mr. John Kingston, Sir James Sibbald David Scott, Bart., and Mr. Duncan Macdonald—were re-elected.

Sir J. S. D. SCOTT, Bart., acknowledged the re-election of himself and colleagues.

Mr. Charles Barclay, of Messrs. Kendall and Co., was then elected a director in the room of Mr. A. Robertson.——Mr. BARCLAY acknowledged his election.

On the motion of Sir EMILIUS BAYLEY, the following resolution was passed: "That this meeting learns, with the greatest satisfaction, that in the interest of the public, as well as of bank proprietors, legislation with the view of limiting the liability of shareholders has received the report of the directors, and desires to strengthen their hands by a strong expression of opinion as to the expediency of such legislation."

Cordial votes of thanks were then passed to the Chairman and directors, to the joint general manager and officers, and the meeting broke up.

BLUE TENT CONSOLIDATED HYDRAULIC GOLD MINES OF CALIFORNIA.

The annual general meeting of shareholders was held at the offices of the company, Austinfriars, on Tuesday,

Mr. J. IRVING COURTENAY in the chair.

Mr. W. J. LAVINGTON (the secretary) read the notice calling the meeting.

The CHAIRMAN said: Gentlemen, our history for the year 1878 can be summed up in a few words. The canal gave an excellent body of water as long as there was water in the South Yuba river, from which the supply is drawn. This was up to July 1. The South Yuba Company had no water to spare us, and we consequently had to stop working our mines at that date, and, with the exception of a brief period in the autumn, when we were supplied with some from the Fall Creek Lakes Company, there was no water procurable from any source until last February. The winter in California resembled in severity the winter in this country—a long-continued and severe frost closing the streams till the middle of February, when the usual heavy rains set in. You know we are dependent upon water for our motive power, and we have endeavoured—not unsuccessfully, I believe—through the medium of the Fall Creek Lakes Water Company, to materially increase in ordinary seasons the available supply of summer water. We have been selling some water to mining companies on the line of the canal during the winter; the particulars are not yet to hand. We only sell what we cannot convey to our own mines, owing to the lower portion of our canal being of a smaller capacity than the upper section to the town of Omega. We have gone over a good deal of country in our search for water. Our system of canals, when combined with that of our friends the Fall Creek Lakes Company, covers an extensive district—of about the distance from London to Brighton. The working results of the mines for the past year strikingly confirm the opinion formerly expressed by our manager, Mr. Price, the gravel having given the richest yield of gold it ever did. I called attention last year to the high average of the gold yield —78 cents to the inch of water—and I was hardly prepared for so considerable an increase in the yield of gold as we have had, our main property—the South Yuba —having produced 87½ cents to the miner's inch of water for all the water used upon it during the year 1878. I know few mines can show a better record than this. The total produce of gold from this claim was $70,688·04, and the cost of producing (as shown by Mr. Price in his report) was $30,000, leaving a profit of $40,688·04. This profit was earned in less than five months, working only ten hours a day, and using 80,637 miners' inches of water. We must endeavour to increase our openings, so as to enable the pipemen to wash more hours in each day on bottom gravel—as, indeed, I note by the superintendent's weekly reports they are just beginning to do. At the above rate, this mine earned a profit of over 50*l.* a day for every day it was at work. The other two points we are working—Gopher and Blue Lead—are quite subsidiary to the main point of attack. The Gopher especially is worked solely to carry off the top gravel, thus enabling us to wash off the rich bottom gravel of the Yuba more cheaply and rapidly: 99,332 inches of water were used on these claims, yielding $21,808·73. We have had no benefit as yet from the outlay upon this part of the property, none of the bottom gravel which has been stripped by means of the Gopher sluice having been worked, but a powder blast was put off last month under this gravel to prepare it for immediate washing. This gravel is represented in the map by blocks N, O, P, and 4, 5, 6, and 7. You will have noticed that the process of stripping off the top gravel is steadily proceeded with. It is advisable to keep well ahead of the washings on the bottom gravel, and this work is pushed on vigorously while water is plentiful. The washing of this upper stratum is now in progress at blocks 6 and 7 and N, O, P, Q on map. I look for good returns during the rest of the season. The cleanup, including one of $10,000 wired this morning, amount to $23,500. They have hitherto been affected by the sliding into the cuts of large masses of the top stratum that had been loosened by the heavy rains. This has to be washed away, and we shall ultimately benefit by having got rid of it without the expense of powder. Turning now to another subject, I note that the dispute I alluded to two years ago between the miners and some of the farmers on Bear river, as to alleged damage to low-lying lands near the banks of that river, has dragged its slow length along ever since, and a local judge in a farming district has given a decision in favour of the farmers, which, of course, has been appealed against. Only a comparatively small quantity of agricultural land is in any way affected by it, and the value of the land in question is utterly insignificant in comparison with the value of the gold mines, the value of the farming land being probably a few dollars per acre, while the hydraulic gravel beds have been proved to contain gold in amounts varying from 10,000*l.* to 60,000*l.* sterling per acre. Since the discovery of gold in California in 1848 the production has been 1100 or 1200 millions of dollars, and it is estimated that in the nine mining counties in which the gravel beds are situate there still remains a very much larger quantity of gold than the above grand total. When one considers what an increase to the wealth of California and of the world there is stored up there ready to be won it is quite surprising to hear some people talk as if the raising of some tons of alfalfa and a few thousand bushels of wheat was likely to hinder the production of gold—at a time, too, when from a variety of causes there exists a greater demand than ever for this metal. The sediment from the hydraulic mines (which is now wasted) is composed of pulverised material forming the auriferous banks, and contains all the ingredients for making valuable land, and actual experiments have proved that good crops can be grown on it. It is an interesting problem for engineers to suggest a method by which this waste material can be utilised, and the possibility of injury to anyone avoided. We shall watch the progress of the dispute, and, indeed, the principle involved affects not only hydraulic mining, but every class of mining, and as gold mining has made California the rich and prosperous State she is today, therefore anything affecting in the slightest degree this great industry is of prime importance to her welfare as a State, and you may rest assured it will be dealt with, should the occasion arise, as a State question. In this connection I cannot refrain from drawing your attention to an article in the Edinburgh Review for January, entitled "The New Golden Age," which deals with the production of gold throughout the world and its effects upon prices, and as a branch of the subject the reviewer devotes a portion of his memoir to considering the reserves of gold stored up in the auriferous gravel beds of California, which he calls absolutely incalculable, and when you consider that the main gravel bed to which he calls attention extends over 50 miles of country, is one mile broad, and is on an average from 200 to 400 ft. in depth, this expression of the vastness of their gold contents is amply justified. To those who have given much time and labour to the production of gold from this source, and to Blue Tent shareholders generally, whose property is one of the most extensive and valuable in the whole State, being situate in the heart of the gold district so ably described by the reviewer, this independent and skilled testimony to the solidity of the basis of hydraulic mining in California is very welcome. I think you all now must have confidence in the property, and I hope that during the year the shareholders will find themselves in a position to increase their holdings in the 10 per cent. debentures the company is prepared to issue to clear off the floating debt. (Cheers.) I beg to move the adoption of the report and accounts, and call on Mr. Bird, who visited the mines last autumn, to second the resolution.

Mr. REGINALD BIRD, in seconding the resolution, said: After the very full statement of the Chairman it is, perhaps, unnecessary for me to say anything, but as I am the last director who has visited the mine I should like, if you will allow me, to make one or two observations. In the first place, as I have before stated in a letter which has been sent to the shareholders, I was very much impressed with the size of the property and the great depth of the gravel, and also with the very small amount of work that has been done—I mean the small amount of gravel which has been washed off down to the bedrock. This bottom gravel is, as you know, the richest by far, so in reality the best of your property is practically untouched. It was only, however, after going over the Blue Tent canal that I was able to appreciate to the full extent what an enormous undertaking the whole business is, and to understand why so much time was taken to complete the work; in fact, when one sees the canal going through long tunnels in the solid rock, and then for miles together see the flumes hanging on to the sides of precipices many hundred feet above the bed of the river below them, it is hard to understand how the work was completed at all; in short, it is a splendid bit of engineering. By the way, walking over those flumes I do not put down as the most pleasant experience I had during my trip, notwithstanding the magnificent view down the gorge of the South Yuba river, and as I hear some of our shareholders may visit the mine during this summer I would advise them at once to go into training under Blondin. The quality of the gravel, as the Chairman has said, has been fully and satisfactorily proved, and the only question is the supply of water. In this respect we may expect considerable help from the Fall Creek Company this year, and I feel sure we may rely on much more in the future when their system of reservoirs is completed. For the first time this year we are in a condition for steady and systematic work, and I cannot help thinking from all I saw and learned in California that we may soon expect to see Blue Tent rank among the first of the dividend-paying hydraulic mines of that State. I was in Marysville during part of the trial to which the Chairman has alluded, and I heard there that the judge had early in the case expressed his opinion that the question was of such importance that it must be settled finally by the Supreme Court whichever way he gave his judgment. There is one other point on which I want to touch. I wish thoroughly to convey to you the very favourable impression given me by both the superintendent and his leading miners. They all seem clever up to any emergency, and thoroughly to be trusted to carry out the work in their several departments. (Cheers.) I beg to second the adoption of the report.

The CHAIRMAN said he should be happy to answer any questions.

Mr. NEAME said he should like to know what proportion of the total production of California came from the hydraulic mines?

The CHAIRMAN: I have been looking into that question, and as far as can be ascertained I think I may say that taking the annual gold yield of California to be about 19 millions of dollars, of that amount the hydraulic mines produce from 11 millions to 13 millions. There is considerable difficulty in getting accurate returns of the gold yield, but from the best information I have had access to I think these figures are not far off the mark. That will show you the great importance to California of its hydraulic mines. Some of the hydraulic mines will not furnish their returns, and there are no means of getting them; therefore, there is an element of uncertainty, but the figures I have given you will find to be approximately correct.

The resolution was then put and carried.

The CHAIRMAN proposed the re election of the retiring directors, Mr. Charles S. Elliott and Mr. Reginald Bird.

Mr. STUNT seconded the resolution, which was put and carried.

Mr. CHARLES S. ELLIOTT, in acknowledging his re-election, said he should continue to do his best to promote the interests of the company.

Mr. R. BIRD also acknowledged his re-election, and referred to the great benefit which was derived from the yearly visit of a director to the property.

The auditor—Mr. Alfred Good—was then re-appointed, and ten guineas voted him as remuneration.

The CHAIRMAN then moved a cordial vote of thanks to Messrs. Price and Hughes, the general manager and superintendent of the company, for their services during the past year.——Mr. F. NEAME seconded the resolution, and said he knew both the gentlemen named, and had formed a high opinion of their ability and capacity.

The resolution was then put, and carried.

Mr. STUNT proposed a vote of thanks to the Chairman for the great interest he had taken in the company, and which had been so much to the advantage of the company.——Mr. E. NEAME seconded the resolution, which was put, and carried.

The CHAIRMAN: I am very much obliged to you for this vote of thanks and for the hearty support you have accorded me. I think of going out again in the summer, unless anything prevents me, to look after our several interests there. You know we have established in this company a system of a director going out nearly every year. I believe it is a good system, and one which I shall endeavour, as long as I am chairman of the board, to keep up, and I think it will meet the approbation of the shareholders. (Cheers.)

The meeting then broke up.

FALL CREEK LAKES WATER COMPANY.

The annual general meeting of shareholders was held at the offices of the company, Austinfriars, on Tuesday,

Mr. J. IRVING COURTENAY in the chair.

Mr. W. J. LAVINGTON (the secretary) read the notice calling the meeting.

The CHAIRMAN said: Gentlemen, I rise to move the adoption of the report and accounts, and considering the result of the first year's operations of the company I think we are fairly entitled to congratulate ourselves. At the previous meeting—commonly called the statutory meeting—I ventured to sketch the outline of our work for the year 1878, and though obstacles wholly unforeseen caused the directors much anxiety, and threatened, indeed, at one time to throw a considerable portion of our construction work into another year; still, the programme I then gave has been substantially adhered to. A strike of workmen such as we had to encounter at a critical moment—for the construction of the canal was in full swing—demanded prompt and vigorous action on the part of those charged with the execution of the work, and I say that praise is due to Mr. Price and Mr. Hughes for the manner in which they dealt with it. It was fortunate that our director, Mr. Bird, was also there to aid with his advice. The canal was in consequence not finished until late in the summer. Meanwhile the surplus water, of which, owing to the abundance of snow in the mountains, there was a considerable stream, ran to waste. The increased cost of construction and the loss of revenue from these causes were not far short of 3000*l.* The report of the general manager goes into every detail of the construction of the various sections of the canal, and the map has been added so as to embrace the latest improvements and additions to the property, though it does not pretend to absolute accuracy. You will notice in perusing this report that additions are in course of being made of lakes and reservoir sites not included in the original scheme, and it is our intention to raise the embankments on the lakes and increase the storage capacity in accordance with the experience we gain each year as to the amount of rainfall and the watershed. The demand for water in California is increasing, but, as you well know, every drop we can store up we intend to sell to the Blue Tent Company during the summer months; that company will gladly take all the water we may have to sell at any time, and the sooner we complete our reservoirs the greater will be the profit to both companies. We were not able to do as much work as we hoped on the lakes last year, the canal having taken a longer time and cost more money than was anticipated, owing to the causes I have mentioned above, but on the other hand, an eligible site having been found near the lower end of the canal, an additional reservoir has been constructed there by which we can also regulate the delivery of water for sale. The sawmill has proved a profitable purchase, and we shall continue to cut and sell lumber. You will notice that on the face of the accounts the company has only a small sum of cash in hand wherewith to pay the proposed dividend, but I need only call attention to the date to which the accounts are made up—Dec. 31, 1878—and to state that since that time a portion of the sums then due the company has been paid. The balance-sheet shows that there are several amounts owing by the company. These are on construction account, and I would here remark that at the outset of the company it was intimated to the shareholders that whatever profits were realised from the sale of water during the construction of the works, which will extend over two or three years, would be divided among the shareholders; and, again, a good portion of the indebtedness is for tools and materials which are available for this year's construction work, but no valuation of assets has been made. The directors are, therefore, of opinion that the original intention should be carried out and the proposed dividend be paid. Seeing that the company has done well in the first year of its existence, and that the total capital is but small —20,000*l.*—I have no doubt the shareholders will take up a sufficient number of the remaining shares to enable us to pay the balance due on construction account, and also to do whatever may be deemed advisable in the way of increasing the size of our reservoirs. I move the adoption of the report and accounts, including the recommendation for the payment of a dividend at the rate of 5 per cent. per annum.

Mr. R. BIRD, in seconding the resolution, said that Mr. Price put a great value on the reservoir, near the ditch, as it would supply an excellent stream of water, and one man could flush the Blue Tent ditch and regulate the sale of water throughout the whole year. The Courtenay reservoir which was being made would hold a large amount of water, every drop of which could be drawn off. Of course, it was difficult to say what the rainfall would be, but he had no doubt whatever that the rainfall of the country would be sufficient to fill both those reservoirs.

The CHAIRMAN said there were several points of interest in connection with the Lakes. One was the great depth of the principal lake. The depth had been tested, and in the centre no bottom was found at 100 ft.; and one of the points he wanted to get at was as to what area of the lake had that great depth, because if the depth extended over any great area it was of importance to the company, because, although they might not be able to cut a dam sufficiently deep to let off all the water, still possibly they might get it out by some other means. The estimated size of the Courtenay Lake was about 70 acres. They knew how wild the district was, and how difficult it was to get particulars of the rainfall, but as time went on they must obtain experience on the point, and increase the capacity of the reservoirs. It was an extensive watershed, and the directors were anxious to raise, as far as they could, the embankment on the lake, so as to prevent the water running to waste.

Mr. NEAME asked what material there was at hand for raising the embankment?——The CHAIRMAN said there were plenty of rocks which were considered suitable, and also a great quantity of timber; in fact, there was everything handy.

Mr. STUNT asked whether any arrangement had been made with the Blue Tent in order to get the whole of the water this company could supply, and whether any price had been arranged between the two companies. Another question was whether, in the event of of the Blue Tent Company not becoming purchasers there were any other hydraulic mines or properties which would take the water?——The CHAIRMAN said there was no binding agreement between the Blue Tent and the Fall Creek at present. The Fall Creek Company was composed mainly of the same shareholders as the Blue Tent, and the directors were the same, and the intention was that all the water of the Fall Creek Company should go to the Blue Tent, and it would be easy to have an agreement drawn up in case of the successors of the present directors not taking the same view. As regarded the price, the Fall Creek charged the same price which the other companies charged the Blue Tent. Along the whole line of the Blue Tent Canal there was a large quantity of auriferous gravel, and there had been a good deal of prospecting done in the neighbourhood of the Blue Tent, and the demand for water was a great deal in excess of the supply. He dare say other companies than the Blue Tent would be glad to take this company's water if the Blue Tent did not take it, but seeing that the Blue Tent Company would want water for about 100 years, he did not care much what the other companies did. (A laugh.) As long as he had anything to do with the Blue Tent he would not allow anyone else to get the water. Several companies had been organised to work the gravel deposits along the line of the Blue Tent Canal, and the difficulty was not with regard to finding rich gravel, but with regard to getting water, as the water supply was limited, as nearly all the water in the mountains had been taken up by American companies before this company got there; and he might mention that some of the gentlemen who owned the properties stated that one of the benefits attaching to their properties was that they could rely upon water being furnished by the South Yuba and Blue Tent Company. The Blue Tent would have to do what they were now doing—namely, sell water to those companies during the winter months when they had more than they could use; but he was not prepared to say that the directors could supply those companies with water during the summer.

The resolution proposed by the Chairman was then put, and carried.

The auditor—Mr. Alfred Good—was then re-appointed.

The CHAIRMAN said he had proposed a vote of thanks to Mr. Price and Mr. Hughes in the other company, but this was a distinct company. Those two gentlemen had had a great deal to do in connection with the Fall Creek Company, and he therefore moved a hearty vote of thanks to them, and he would ask one of the shareholders to second it.——Mr. NEAME seconded the resolution, which was put, and carried.

On the motion of Mr. STUNT, seconded by Mr. F. NEAME, a cordial vote of thanks was passed to the Chairman.——The CHAIRMAN acknowledged the compliment, and the meeting broke up.

UNITED MEXICAN MINING COMPANY.

The ordinary half-yearly general meeting of shareholders was held at the offices of the company, Great Winchester-street Buildings, on Wednesday—Mr. CHARLES MORRIS in the chair.

Mr. W. M. BROWNE (the secretary) read the notice convening the meeting, and the minutes of the two preceding meetings, which were confirmed. The report of the directors was, as follows:—

The London audited balance-sheet for the half-year ending Dec. 31, 1878, and the Mexican accounts for the entire year 1878, are herewith submitted to the proprietors. The old concern, including expenses and management, rent, &c., shows an excess of outlay of $7665. The expenditure in the new concern amounted to $36,384, but as the original owners paid $7119 on their shares, the company's outlay is reduced to $29,265 in the twelve months.—Mine of Jesus Maria-y-José: The owners have carried on work in this mine on a small scale with bad results in the latter half of the year, and have not paid anything to the company in the last six months. The debt has been reduced by the $834, of which mention was made in the directors' report issued in November last.—Mine of Rayas: The drainage of the mine, both by steam-engine and horse-whims, has been continued by the owners at an increased cost. The profits have been small, and only $953 have come in towards the liquidation of the debt.—Hacienda of Duran: Great difficulty has been experienced in obtaining ore by purchase, and only part of the mills has been employed. The ore, low in ley, proved difficult in reduction, and unusual losses both of quicksilver and silver told against the results, which left a loss on the year of $3114. From the commencement of the new year a better class of ore has been obtained, and as the yield of the new workings in San Cayetano increases it is anticipated that the hacienda will be worked to leave a fair profit.

NEW CONCERN.—Adit of San Cayetano and Mine of San Antonio de la Ovejera: The adit of San Cayetano (or Frente de San Ignacio) was continued till it communicated, on Oct. 12, 1878, with the cross-out of San Juan. The cross cut will be carried further southwards before the adit is recommenced, but both works are in suspense till further light is thrown upon the runs of the different lodes by the works in San Cayetano de la Ovejera, to be referred to in subsequent paragraphs. —Mine of San Cayetano de la Ovejera: The Pozo de Guia was continued downwards, and the Contracielo de San Cesario upwards from the Frente de los Angeles till they met on Dec. 12, 1878, and thus completed the roadway down from the mouth of San Cayetano de le Ovejera to the shaft of San Augustin, serving also to ventilate all the workings, and to run off the water from the upper workings. From this Pozo de Guia a gallery called San Mateo on the lode has been carried to the north-west 56·27 metres, the lode in it looking promising at latest dates. From Los Angeles a cross-cut called San Lazaro has been opened, and has advanced 20·40 metres towards the lode, which ought to be reached in a few weeks. In different parts of the old mine ore has been found as the workings have been cleared out, but the point of chief interest at present is the Pozo de San Pablo, situate on the south-east side of the old shaft of San Cayetano. In it, towards the end of January, fair ore was discovered and has been worked on downwards with a gradual improvement from week to week. In eight weeks ore worth $1693 had been taken from the bottom of the Pozo and some lateral working, and the extraction in the eighth week ending March 15 had been 161 cargas (upwards of 20 tons). One of these workings, called Santa Antonio, had been driven 16·90 metres on ore along the lode, and a winze had been opened in the end parallel to San Pablo. These San Pablo workings in their downward progress should pass close to a small cross-cut which was commenced from Angeles in November, 1877, driven in 9 metres, and left after traversing two lodes. It has now been recommenced in the hope that the ore above will be also found on the Angeles level.

MINES OF BUENOS AYRES, SAN MIGUEL, AND EL DIAMANTE.—Little has been done in these mines till progressive explorations in the ore-bearing ground tend to clear up existing doubts. The truth of reports regarding the former richness of San Cayetano de la Ovejera is now proved beyond a doubt, and the water, the enemy which the old miners could not overcome, can now be run off by the adit without expense as far down as the level of Angeles. The bunch of ore in San Pablo is placed in a break in the lode (which in the La Luz district is a favourable feature), as from San Pablo eastwards the direction of the vein seems to be nearly east, whereas on the north-western side of the winze it runs off north-west, showing a deviation of nearly 45°. It would appear that in the vicinity of the old shaft of San Cayetano two or three lodes are found running at divergent angles, which will require minute observation and investigation for the direction of future exploratory works. The great adit must be continued to the north-west, to insure drainage and ventilation down to its level, and if the ore from San Pablo makes down to Angeles, and thence further down to the adit level, the extraction will gradually increase, and new discoveries may with confidence be looked forward to. In conclusion, the directors think that, without undue elation, and making all allowance for the uncertainty of mining ventures, they may congratulate the shareholders of the company on the decidedly improved appearance of their property. A mining concern with pits sunk and roadways made, with almost costless drainage insured to depths of upwards of 200 metres, in possession of ample territory, and with an extraction of ore of 20 tons in the last week, ranging at upwards of 20 to 60 ozs. per ton, has certainly assumed a very different aspect from that which the directors have announced in former reports, and they venture to hope that future accounts from Mexico may improve gradually, and be still more satisfactory.

Since the above was in type more recent and favourable advices, dated March 26, have been received from the Commissioner, Mr. Hay. The vein in the Pozo de San Pablo was a little narrower, but still of the breadth of 1¼ metres, all in good ore. In San Antonio in an advance of 3¼ metres in the last week; the ore continued as good as ever, 85 centimetres wide. In Santa Margarita the ore had improved. The extraction of ore in the last week had increased to 253 cargas (about 38 tons), of the value of $850.

The CHAIRMAN said he thought the shareholders would, in reading the report, say that it was one of a very flattering and pleasing character. It had been drawn up so amply that he had very little indeed to add to it, but since the report had been issued the directors had, however, received a despatch from Mr. Hay, which he was sorry to say was not quite so pleasant as he had hoped. In two points there had been a little interruption. In one of these a boulder had been met with of the same kind as the one found in February last. The boulder met with in February was passed through in about eight days, and good ore was then found, and, reasoning by analogy, there was no reason to suppose that the boulder met with recently would not soon be passed through, and ore found on the other side. The work at this point was being pushed forward, and he hoped the interruption would only be very temporary. In the Pozo de San Pablo barren ground had been met with, but the drivings were being continued, and there was every reason to hope that ore would soon again be met with at this point. In the meantime they continued to raise ore from two or three other points. There was every reason to say the report on this mine which had been given to them had turned out perfectly correct. They were told they would have to work to a certain point before finding ore, and this prediction had been verified, and ore had been found. Shareholders should not be disheartened because of a trifling temporary interruption, which might only last for a week or a fortnight. He (the Chairman) then moved the adoption of the report and accounts.

Mr. WILKINSON seconded the motion, and expressed himself dissatisfied with the results of the hacienda. He also thought that the amount of 1200*l.* for calls in arrear was excessive.

The SECRETARY replied that there was no such amount as 1200*l.* outstanding at the present time. The accounts were made up to the end of December, and the last call was only due on March 31 last. As it was stated in the body of the report, several amounts had been received since the date to which the accounts were made up. The sum outstanding has been reduced to about 800*l.*, including the arrears on the call due at the end of March.

The CHAIRMAN added that if possible it was advisable to avoid stringent measures with regard to the arrears of calls, and to use a certain amount of toleration.

The CHAIRMAN, in reply to Mr. CAVE, M.P., said the directors could not without the consent of a meeting of shareholders make calls.

Mr. T. CAVE, M.P., asked if there was any fair and reasonable expectation that the shareholders would receive any return for their outlay and patience? If there was no improvement before the next meeting he thought it would be well to take the opinion of shareholders whether it would not be wise to liquidate the affairs of the company.

The CHAIRMAN replied that he had belonged to the company exactly fifty years, and he could say most conscientiously that he believed it was a fair and legitimate speculation, and that it had a very good prospect of success. He had been ambitious to retain the chairmanship of the company until it could pay a dividend again, and then he would ask to be allowed to retire; but he certainly thought they should go on until they were satisfied that there was something or nothing to be got out of the mine. (Hear, hear.)

Mr. CURTIS said he was better satisfied with the report now presented than with the previous reports for some years—(hear, hear)—and he thought they owed a debt of gratitude to Mr. Furber for his judicious counsel to the board from time to time. The newly-acquired property was answering Mr. Furber's

anticipations in every way, and he thought the future of the company loomed with very great promise of success. (Hear, hear.)

Mr. STAPLES thought it would be a most suicidal policy to wind-up at the present time, and he was surprised that anyone should recommend such a course. If liquidation were decided upon the shareholders would, probably, not get 6d per share, whereas they could at the present time go into the Stock Exchange and get 8l. 15s. per share. (Hear, hear.) Everything which had as yet happened had been the precursor of the present bright prospects of the company. The adit level had been driven with the one object of unwatering the mines, and now that object had been achieved it seemed all the opinions of Mr. Furber with regard to it were about to be realised. The prospects had considerably improved, and he thought at the present moment that ore ground had been opened along the lode to the extent of over 30 yards, and which ought to yield considerable quantities of ore. (Hear, hear.) This ore was of paying value, and he believed the grade of ore would improve, and that the shares of the company might be at a price which would surprise many of the shareholders. (Hear, hear.) It was nothing for mines in Mexico to produce from 100,000l. to 600,000l. or 700,000l. per annum profits, and he believed this company had as good prospects as nine tenths of the mines which had produced these enormous profits. (Hear, hear.) It might never return a profit at all—that no man could say with certainty—but as, so far, all the anticipations of Mr. Furber (to whom their sincere thanks were due) had been realised, there was every reason to hope with him that the company would become prosperous, and that Mr. Cave would hereafter have reason to be satisfied with his investment. (Applause.)

Mr. PRUST also expressed himself satisfied with the future prospects of the company.

The CHAIRMAN, in reply to Mr. STAPLES, stated that Mr. Furber was unable to be present at the meeting owing to ill health, but that the report had been written with his concurrence.

Mr. J. C. RUDING said as the sentiments expressed in the report now presented had the sanction of Mr. Furber he thought there was reason to have very sanguine views with regard to the future of the property. (Hear, hear.)

The report and accounts were then unanimously adopted.

The retiring directors (Messrs. William Adam and John W. Williamson) and the auditors (Messrs. William Turquand and Jeremiah Carter) were severally re-elected.

Messrs. ADAM and WILLIAMSON returned thanks for their re-election.

Mr. CURTIS moved a vote of thanks to Mr. Furber (the honorary consulting engineer) and Mr. E. Hay (the superintendent of the company).

Mr. RUDING seconded the motion, which was carried.

On the motion of Mr. T. CAVE, M.P., seconded by Mr. LEVY, a vote of thanks was passed to the Chairman and directors, and the proceedings then terminated.

SANTA BARBARA MINING COMPANY.

The tenth annual general meeting of shareholder was held on Wednesday, April 30, at the offices of the company, Liverpool,

Mr. E. S. HOLLAND in the chair.

The SECRETARY read the notice convening the meeting, and the minutes of the preceding meeting, which were confirmed. The report and statement of accounts were taken as read.

The CHAIRMAN said he had little to add to the information contained in the report, which was, as usual, made as full as possible. The results of the working of the mine during the past year, which bore resemblance to those of the year 1876, he considered were very satisfactory, more especially when it was borne in mind that almost the whole of the year's profit was earned in the second half of 1878, a good augury of what might be expected for the current year. Comparing the past year with the year 1878, in which much the same quantity of mineral was raised from the mine, there was an increase in the total value of the gold returned, while the expenses for 1878 appeared to compare somewhat unfavourably with 1876, but this was more imaginary than real, for the year 1876 had the benefit of certain transfers to capital account, while in 1878 everything had been charged to revenue. The ore had been raised from greater depths than formerly, and this tended somewhat to increase the costs. The available balance shown at credit of profit and loss for the year 1878 was 5662l. 8s. 5d., out of which an interim dividend of 1s. per share, amounting to 2000l., had been paid in December last, and from the sum remaining the directors proposed to put 500l. to the reserve fund, a fund which they considered it advisable to build up in view of any future requirements for increase of stamping power and other machinery, to pay a further dividend of 1s. 6d. per share on account of the year 1878 on the 26th proximo, and to carry forward the sum of 162l. 8s. 5d. The general remarks of the manager give full information regarding the working of the mine, the most important point to which he draws attention being the increased value of the lode in depth, and its regularity of size and appearance below the 50. If we can get a regular lode, free from the fluctuations in quality and value which have at times made their appearance in the upper stopes, we shall be in much better position, as you may understand when you observe that close upon 3000 tons of mineral raised from the mine during the year 1878 was thrown on one side as refuse stone, this large quantity being chiefly caused by the fluctuating quality of the lode in the No. 4 or upper stopes. And having regard to the improvement of the lode below the latter horizon, we may safely, I think, look for a large diminution before long in the proportion of this refuse ore. If one half of this refuse stone were to become of value see what a great increase of profit would accrue from this source alone. The mine has continued to be developed in depth, and the shaft has been sunk 10 fms. during the year on a good lode of average size, and since the close of the year the lode has further opened out in a most satisfactory manner, our last advices being that it was from 14 feet to 15 feet wide, and I trust that this improvement may continue. Regarding the paragraph in the report alluding to the recommendation of Mr. Hilcke that more water-power be brought on to the mine to extend our works, the board have not yet received all the detail of the new works proposed to be taken in hand, but should it be necessary to raise some little additional capital for these purposes, the shareholders would be called together and full particulars laid before them. It could hardly be supposed that the reserve fund could do much towards these new works, and, therefore, some new capital might be required, which would doubtless be in the shape of new shares, to be offered, of course, for subscription to the existing shareholders. He (the Chairman) then alluded to the incidence of the gold tax recently enforced by the provincial authorities, and he stated his satisfaction in being able to inform the shareholders that the collection of this tax had now been suspended by order of the Imperial Government. He said that he had pleasure in drawing their attention to the paragraph in the report which stated that Mr. Hilcke's engagement as manager had been renewed, Mr. Hilcke having been untiring in his exertions for the interests of the company, and having been a most efficient person. The directors recommended that Mr. Thomas Trevellas be added to the board, and he felt sure that the advice and assistance that Mr. Tregellas would be ready to afford to the directors would be of much value when his lengthened acquaintance with the company's mine was considered. Coming to the mine captain's report, he would like to observe that with a less number of men boring in the mine more stone had been raised than in the year 1877—a fact which reflected credit on their mine captain. After some further remarks on the accounts the Chairman said that the prospects for the current year were very cheering. In January a profit of over 1000l. was shown, and although February showed some falling off as compared with this, he did not think much importance should be attached to this, since it was owing to a falling off in the value of only one particular part of the lode in which a change of this nature had occurred before, and had lasted but for a short time. As he had already pointed out, the lode in depth was being opened up in a satisfactory manner, and showed no signs of fluctuations in the same adverse direction, as was the case with the lode above in February last. A number of samples from the lode in the bottom of the shaft were in the room, and could be inspected by the shareholders. These samples had a strong, healthy-looking appearance. The Chairman then moved—"That the report of the directors, with statement of accounts for the year ending Dec 31 last, as presented, be and is hereby received and adopted, and from the balance at the credit of profit and loss the sum of 500l be placed to reserve fund, and a final dividend of 1s. 6d. per share for the year 1878 be declared, payable on May 26."—Mr. J. H. DENNIS seconded the resolution.

Mr. WILLIAMSON enquired to what depth it was practicable to work at the company's mine? He believed that the St. John del Rey Company were working very much deeper than this company.—The CHAIRMAN replied that he believed the St. John del Rey Company were working at a greater depth than 200 fms., while the Pari Mine was but from 70 to 80 fms. deep in the deepest part.

Mr. TREGELLAS stated that the Morro Velho Mine of the St. John del Rey Company was nearly 300 fathoms deep in its deepest workings. No great difficulty had hitherto been experienced in working to this depth.

Mr. TREGELLAS, in the course of the discussion which followed, stated he was very pleased to learn that the lode of this company's mine was increasing so much in width as to 15 ft., he recollecting the time many years since when the lode of the St. John del Rey Company's Mine was much less in width than it was at present, and the yield per ton also less. This was at a shallower horizon, and when the mine was deepened the lode improved both in size and quality, and why might not the same occur at Pari.

The CHAIRMAN, after replying to one or two other questions, put the resolution to the meeting, and it was carried unanimously.

Resolutions were then carried unanimously re electing Mr. C. Frederick Carne a director of the company, and electing Mr. Thomas Tregellas as a director, in proposing the election of whom the CHAIRMAN alluded to the deep interest Mr. Tregellas had from the first taken in the concern, and the peculiar satisfaction it afforded him of thereby recognising Mr. Tregellas' services in some measure.

Mr. TREGELLAS, in returning thanks for his election, gave an interesting *resumé* of his connection with the company, and the vicissitudes through which it passed in its early existence, ascribing its want of success in the first few years of working of the mine to the omission of the former management in not having driven the deep adit level to unwater the mine, which had since been completed. He gave some statistics of the working of the mine when he was in charge, stating that at one time the stone produced as much as 7 oltavas per ton in one part of the mine, and that he saw no reason why this might not again be the case. He considered that Pari Mine might have a great future before it.

Motions were carried unanimously increasing the annual remuneration of the board of directors by the sum of 100l. per annum, and re electing Mr. A. W. Chalmers as auditor; also giving the best thanks of the meeting to Mr. Hilcke and the staff at Pari for their exertions in the interests of the company for the past year, and the proceedings closed with a vote of thanks to the Chairman and the other directors of the company.

SOUTH TOLCARNE MINE.

A general meeting of shareholders was held at the offices of the company, Austinfriars, on Thursday,—Mr. CLARK in the chair. The Secretary read the notice convening the meeting. The financial statement was submitted, charging five months' cost to the end of March, showed a credit balance of 449l. 15s. A call of 2s. 6d. per share was made. The committee of management was re-elected. A vote of thanks to the Chairman terminated the proceedings. The following report was read:—

May 6.—The 26 fm. level has been driven east of the engine-shaft about 110 fms. on the north gossan lode; the ground is easy for exploring, six men having extended the level 11 fms. in the four weeks preceding the last pay. The lode has a most promising appearance for yielding copper, and it occasionally produces some rich quality ore. We have still about 130 fms. on the course of the lode to the eastern boundary in entirely virgin ground, and we cannot but advise the extension of the level east. We have put up a trial rise about 7 fms. in the back of the 36 east; the lode in this rise has yielded some good copper, and has a kindly appearance. We have also put out a short cross-cut south, and cut two branches or feeders, which will unite with the main lode in depth. As already stated, we have driven the 36 east over 100 fms., in a promising lode, which has yielded good nests of ore, and looking at its kindly character for the whole of the distance driven we consider the indications are sufficiently good to advise sinking the shaft deeper. Meantime we would recommend that a tramroad be fixed in the 36, and the end urged on east on the course of the lode, as we are now doing.—WM. RICH, JAMES KNOTWELL.

DOLCOATH MINING COMPANY.

A three-monthly meeting of shareholders was held at the mine on Monday, Mr. MARK GUY PEARSE, of London, presiding. There was a large number of adventurers present. The accounts showed labour costs, merchants' bills, poor and way rates for three months to be 11,609l. 17s. 6d. On the credit side there was for copper ore sold, 19l. 2s. 4d.; tin ores, 370 tons, 14,301l. 1s. 6d., making 14,320l. 3s. 10d.; deduct dues (Mr. G. L. Basset), 1-20th, 716l. 0s. 2d. =13,604l. 3s. 8d.; extra carrage of tin, 11l. 17s. 4d.: total, 13,616l., leaving a profit of 2006l. 3s. 6d.; the balance brought forward is 226l. 8s. 8d. The agents (Capts. Josiah Thomas, James Johns, and Joseph Chynoweth) in their report stated:—

The 352, east of engine-shaft, is worth 50l. per fathom. The 352, west of engine-shaft, is worth 65l. per fathom. We have now opened this level for a length of 10 fathoms, but have not cut through the lode to ascertain its width. The above valuations are for 6 ft. wide. The winze under the 338, east of engine-shaft, is worth for 9 ft. long 50l. per fathom; this winze is nearly holed to the 352. The winze under the 338, west of engine shaft, is worth for 9 ft. long 75l. per fathom. We have commenced to drive the 352 west by the new boring-machine, and so soon as the eastern winze is holed we shall commence to sink the shaft below the 352, and also put another boring machine to drive the 352 east. We have been opening on the lode at the 338 at new east shaft, and find it to be upwards of 3 fathoms in width. We shall shortly commence to sink this shaft in a lode worth for 6 ft. wide 30l. per fathom. Old sump shaft is sunk 2 fms. under the 338; the lode is worth for 9 ft. long 18l. per fathom. The 338, east of new east, is producing a little tin. There is another part of the lode standing to the south, which is probably of better quality. The 338, west of old sump, is worth 15l. per fathom. About 8 fathoms before this end we have commenced to sink a winze under the 326, where the lode is worth for 9 ft. long 30l. per fathom. The 326, east of new east, is worth 10l. per fathom. The 314, west of old sump, is worth 10l. per fathom. Harriett's shaft is sunk 14 fms. under the 275; the lode is standing to the south of the shaft. The 275, west of Harriett's shaft, is holed to the 275, east of man engine shaft, and a good piece of tin ground laid open for stoping. The 275, west of man engine shaft, is worth 10l. per fathom. The winze under the 254, 20 fms. before this end, is worth for 9 ft. long 18l. per fm. The 264, west of man engine shaft, is worth 10l. per fathom. Stray Park shaft, sinking under the 280, is producing a little tin.—South Lode: The 290, west of cross-cut, is worth 15l. per fathom. The winze under the 278 is holed to its level, and the ground laid open for working. The 266 cross-cut is driven 15 fathoms south towards this lode, and we have we have about 8 fms. further to drive to intersect it. Since the last account we have passed through a branch in this cross-cut, worth 13l. per fathom, on which we intend to drive when we have intersected the south lode.

Capt. JOSIAH THOMAS thought the shareholders would see from the valuations in the agents' report that the mine was still looking extremely well. (Applause.) They had only opened, so far, about 10 fms. at the bottom level, and in no part of that level had they cut through the lode to ascertain its width. In the engine-shaft where they were preparing to cut a flat, they had opened for about 10 feet, and found the lode a very productive one. In fact, he might say for the length opened so far that they had no better level in the mine than the present bottom level. When the winze under the 338 is holed to the 352 they would be able to cut through the entire width of the lode, and they would then have a better and larger piece of ground laid open for stoping than they had in any part of the mine. The south part of the lode was better than the north part, and he thought he was within bounds when he said that it was worth 100l. a fathom with the present price of tin. Taking everything into consideration, he thought they would agree with him that they had done very well. (Applause.) During the next twelve weeks they intended putting in a new skip-road, and raise the same large quantity of tin as in the past.—The CHAIRMAN said the report was one of the best it had been his privilege to see.—Capt. THOMAS remarked that they had scarcely sufficient boiler power to keep the boring machine and whim for drawing the stuff working, and they contemplated starting another boiler to assist in working the air compressor.—Mr. HOLMAN moved the adoption of the accounts, declaring a dividend of 5s. per 1-4296th share—1074l.—leaving a balance in hand of 1158l. 12s. 2d., and the agents' report, which was seconded by Capt. WILLIAMS, and carried unanimously.

The CHAIRMAN said one point that had occurred to him lately was that a revolution has been going on in the manufacture of steel. He was only a man of theory, and his opinions were drawn more from what he read than from any practical knowledge. They could not disguise the fact that some wonderful change was taking place by the conversion of iron into steel, and that steel was being produced at a price fabulously small compared with what it was a few years ago. Some seven or eight years ago steel rails cost about 20l. per ton, and now a similar quantity could be produced for 5l. a ton. How far it was wise for them to turn their attention to the use of steel stamp heads was a question to be determined, but he would advise those connected with that department to make enquiries, for they could now get steel cheaper probably than they had any idea of. He was of opinion that steel could be used with advantage in those departments. As regards the price of tin, they were very much at sea. Hard things had sometimes been said about the smelters, but he hoped the smelters were trying to do the best they could for the county, in the present depressed state of trade in the mining interest, but he confessed it sometimes crossed his mind whether or not they had not been rather an hindrance to the mining interest than otherwise. At the same time he thought they must all admit that the price at which they had been selling English tin, which was rather below the price of foreign tin, had put a stopper upon the sale of foreign tin for a while. He believed that if they (the smelters) had only maintained a degree of firmness, instead of yielding to a lower price, they would have had pounds more per ton than they now had. (Applause.) He said this with great reserve and with no unkindly feeling, as he believed the smelters had done a great deal of good for them; but just now he was puzzled and somewhat pained to see that they were selling English tin rather below foreign tin.

Mr. HOLMAN said it was possible rails might be had for 5l. a ton, but he thought he was safe in saying they could never be produced at that price.

Capt. THOMAS observed that they had tried steel heads on the mine some twelve months ago or more, which lasted three and a half times longer than the average iron stamp-head. For those they gave 32l. a ton, and the iron ones cost 5l. 15s. per ton. They had since had steel heads offered at 26l. a ton, but unless they could have steel stamp heads for less than that it would not pay them. They had been trying cast-steel in various other departments of the mine, and his own opinion was that it would before long displace iron in many parts of the mine.

The CHAIRMAN said the revolution in the steel trade which was going on was of such a startling character that he was sure it would supersede iron

Subsequently the adventurers dined together under the presidency of the same gentleman. On the removal of the cloth the usual loyal toasts were given, after which the CHAIRMAN, in giving "Continued Success to Dolcoath, and a better Price for Tin," said they had passed through a time of difficulty now for a series of years, and if a man had told them four or five years ago that they would have been able to exist, and that the grand old mine could have made both ends meet with the present price for tin, they would have regarded him as certainly one who had lost his reason, and looked upon it as an utter impossibility. However, they had lived to see the day when it could be done, and they were not only able to declare a dividend of 1000l., equal to 5s. per share, but to appropriate another 1000l. towards the balance in favour of the mine, which was of intense satisfaction to them all, and showed very plainly that Cornish mining was not yet doomed. They regarded Dolcoath as a representative mine. It was one of the first mines in which tin was ever discovered that could be worked to profitable advantage below the deposits of copper, and in the year 1850 there were but few men who thought that tin could pay with tin at 60l. or 70l. per ton. He thought that at the present time they had great reasons for expecting a better future. Such reports as they had had put before them that day ought to inspire them with confidence and satisfaction as regarded future operations in the development of their undertaking. Such good results were not brought about without much anxious thought and painstaking, and he could not agree with those who thought they could. He was quite sure they would not have been in such a good position that day had not the manager (Capt. Josiah Thomas) and the other agents of the mine watched over their interests just the same as they would have over their own. Referring to the distress in the county, he said he was afraid the letters which had appeared in the papers seemed too much like pauperising their labouring classes. He feared it was likely to tend to some mischief to our noble, independent, and self-reliant Cornishmen. The distress was not confined to Cornwall; it extended all the world over.

Capt. JOSIAH THOMAS, in reply, said Prof. Robert Hunt some years ago started the theory that the deeper they went in Cornish mines the larger and richer the lode became, and so far as Dolcoath was concerned that had certainly been proved.—One or two other toasts followed, including that of the Chairman, after which the meeting separated.—*Western Daily Mercury.*

NORTH BUSY UNITED MINES.—These mines, which were able to pay a dividend of 10s. per share in October, 1878, have been able to make a profit of 3l. 15s. 6d. only for the six months working ending February. This was of course owing mainly to the reduced price of tin and other minerals, but the mines are now looking exceedingly well, and promise to show a much better result at the next meeting, especially should the price of minerals improve a little. The last meeting of adventurers was held at Redruth on the 1st inst., Mr. Woodward, the purser, in the chair. The statement of accounts for the six months ending February, 1879, showed that the labour cost was 519l.; merchants' bills, 96l.; lords' dues, 64l.; Kenwyn parish rates, 9l.; and bankers' charges, 4l. The black tin sold realised 5s 7l., and the copper ore 113l., and blende ore on account was credited at 75l., which showed a profit on the six months' working of 3l. 15s. In October last a dividend was declared of 10s. per share, amounting to 222l. According to the statement of the liabilities and assets there is owing by the mine for dues 138l., cheques outstanding 100l., and county adit and rates 18l. Against this there are the following assets:—Bills receivable, 118l.; blende account, 75l.; and at the Miners' Bank, 67l.; and there is a balance left in favour of the adventurers of nearly 4l. The agents in their report stated that since the last meeting they had driven the bottom, or 22 fm. level east, 7 fms. 5 ft.; for the last 10 fms. driven in this end the back can be stoped at a profit. They had holed to the Old North Busy Mine, and by this means let down the water and opened and made available some hundreds of fathoms of mineral ground. Some of it is very rich for blende and arsenical mundic, mixed with tin and copper ores. They have cleared the 15 fm. level in the old mine 60 fms., and have about 20 fms. more to get to the end. They will at once commence to raise mineral from back and bottom of this level, and with a fair price for blende and mundic, with the tin and copper that they get out of the lode, a good deal of this ground will work at a profit. The statement of account was passed, and the agent's report received and adopted. The 136 forfeited shares were, by resolution, thrown over the book, and the number is now 888 shares. The question of erecting pumping power was deferred till the next meeting.

THE SCOTCH MINING SHARE MARKET—WEEKLY REPORT AND LIST OF PRICES.

During the past week the markets generally have been buoyant, owing to the extreme cheapness of money, peaceful news from the East, an improvement in the weather, and a belief that trade is now reviving. In fact, all other conditions are favourable, and a little briskness in trade is all that is necessary to set going a considerable speculation for a rise in prices, induced by the low quotations current for many safe securities.

In shares of coal and iron companies, Bolckow, Vaughan (A) have advanced 10s. per share, and Scottish Australian (new) 2s. 6d., while Ebbw Vale are 5s. lower, and Marbella 2s. 6d. Benbares, after having been sold at 17s. 9d., have advanced to 23s., on a circular being issued stating that they have got 60,000l. on the new preference stock subscribed, and that if the applications from shareholders are paid up at once the company can be carried on. Of course, there need be no doubt of the success of this arrangement. Bolckow, Vaughan, and Co.'s new process continues to attract great attention. It has practically doomed the puddling furnaces from the fact that steel will in a great measure supersede malleable iron, alike from its smaller cost and from its superior qualities. It must not be supposed, however, that the Cumberland mines and companies like the Marbella, working iron ore in foreign countries, are now to be ruined; on the contrary, they can purchase the right to work the new process, and though Cleveland will be the first to feel its benefit, and in the greatest degree, still Scotland and the other places we have named, largely producing iron ores at a low cost, will not be slow to share in the revival of trade now approaching in this direction. The Scottish Australian sales for February have been 19,718 tons. Steel Company of Canada shares offered. Ashton Vale, 85s.; Andrew Knowles and Sons, 11¼ dis.; Bolckow, Vaughan, A, 60½ to 61; ditto, B, 35; and ditto 5 per cent., preference, 19½; Bowling, 85; Carnforth, 81; Chapel House, 17s. 6d to 22s. 6d.; Charles Cammell and Co., 18 dis.; Chillington, 40s.; Consett, 16½; Ebbw Vale, 60s. to 62s. 6d.; Great Western, 40s.; Henry Briggs, A, 11½; John Brown and Co., 28½ dis.; Muntz's Metal, 14½; Newport Abercarn, 90s.; Omoa and Cleland, 5s. to 7s.; Parkgate, 28 dis.; Pelsall, 10¾ dis.; Rhymney, 13; Sandwell Park, 14; Scottish Australian, 37s. 6d. to 42s. 6d.; South Wales, 60s.; Staveley, C, 61¾; ditto, D, 10¾; Thorp's Gawber Hall, 20s.; Tredegar, B, 18½; Ulverston, 9; West Cumberland, 7.

In shares of foreign copper and lead companies Rio Tinto 5 per cent. have advanced 2l., Rio Tinto and Tharsis shares (new) each 7s. 6d., Rio Tinto 7 per cent. 5s., and Canadian 6d., while Tharsis are 3s. 9d. lower, and Huntington 2s. The ordinary meeting of the Cape Company is to be held on May 21. The advices to hand from Yorke Peninsula continue satisfactory, as it is evident they have plenty of stuff if the price of copper was only a little higher. The ore returns are 94 tons of 19 per cent. shipped, on hand 260 tons of 14½ per cent., 460 tons smalls of 5 per cent., and 1150 dredge ore of 5 per cent. Tharsis have sold between 21½ and 21¾. Cape are at 27 to 27⅛; English and Australian, 30s.; Fortuna, 85s.; Linares, 85s.; New Quebrada, 35s. 9d.; Rio Tinto 5 per cent., 68; and Yorke Peninsula, 3s. 9d.

In shares of home mines the movements are very important. Aberdaunant are at 3s. 9d.; Carn Brea, 30; Cook's Kitchen, 5s.; Caron, 16s.; Dolcoath, 23; Devon Consols, 35s.; East Van, 30s. to 35s.; Great Laxey, 16; Gorsedd and Merllyn, 58s.; Glenroy, 9s. 3d.; Gunnislake (Clitters), 12s. 6d. to 17s. 6d.; Herodsfoot, 70s.; Killifreth, 2s. 6d.; Llanrwst, 10s.; Melyndur, 15s.; North Laxey, 2s. 6d.; Prince Patrick, 20s. to 30s.; Penstruthal, 1s. 6d. to 2s.; Roman Gravels, 8¾ to 9; Rhosesmor, 30s. to 40s.; South Caradon, 60; St. Harmon, 20s.; Tankerville, 70s.; Tincroft, 10½; Van, 18; Van Consols, 2s. 6d. to 3s.; West Tolgus, 27; West Wye Valley, 16s.; West Chiverton, 65s.; West Assheton, 15s. to 20s.

In shares of gold and silver mines Richmonds have fallen 5s. per share; this week's run is $53,000. The profit at Port Phillip for the month ended April 23 was 965l., against 1174l in the previous month. The produce at St. John del Rey for 10 days, second division of April, has been 11,500 ozs., and the yield 6·3. The Pestarena gold returns for April are 451 ozs. Antioquia are at 12s. 6d.; Argentine, 3s. 9d.; Cedar Creek, 2s. to 4s.; Colorado, 35s.; Don Pedro, 15s.; Eberhardt, 4l. 6s 3d.; Exchequer, 2s. 6d. to 3s.; Emma, 2s. 6d.; Flagstaff, 2s. 6d. to 5s.; Frontino, 45s.; Pestarena United, 2s. 6d. to 3s.; Port Phillip, 7s. 6d. to 9s. 6d.; South Aurora, 2s. 6d. to 5s.; United Mexican, 80s.

In oil companies shares Broxburn have advanced 10s. per share, but Uphall is 10s. lower, Young's Paraffin 5s. 3d., and Oakbank 6d. New Patent Candle are at 21½, Price's Patent Candle 9l. 1s. 3d. In shares of miscellaneous companies business is at a stand. Avonside Engine are at 5s.; Native Guano, 55s.; and United Limners, 25s. In wagon companies shares there has been more business done, and prices advancing. The principal alterations are advances of 1l. each on Scottish original and new shares, which are in demand at 7½ and 8½, respectively. Prices of others are—Birmingham, 13¼; Bristol and South Wales, 4¾; Bristol, 42s. 6d. dis.; Gloucester, 7½; Lancaster, 8½.; Metropolitan, 40s. prem.; Midland, 8; Railway Carriage, 75s.; Swansea, 27s 6d.; Starbuck, 11; Western, 65s.; United States Rolling Stock, 16; Wakefield, 25s.; Yorkshire, 14. In chemical companies' shares, Lawe's 7 per cent. (preference) continue scarce; others are quoted, Langdales, 75s. to 80s.; Lawe's, 8l. 3s. 9d.; Odams, 17; and Newcastle, 15s. to 17s. 6d.

GLAMORGAN CONSOLIDATED LEAD MINING COMPANY (Limited).—This company has acquired the same mine that has been worked by the Llan Gan Company. The property is now in complete working order, and with the necessary capital to develope it there can be no doubt success will be quickly attained. There are several strong well-defined lodes discovered in the sett. The strata are the same as those in which some of the most productive mines in Wales are. The situation of the mine for economical working is good, being close to a high road, and within two miles and a half of the Pencoed Station on the Great Western Railway. The capital is 30,000l., in shares of 1l. each, and the board are to meet on an early day to make allotments.

GOGINAN AND LEVEL NEWYDD MINES.—This property was one of the richest ever worked in Cardiganshire, and a company is again being formed to work it. The grant is traversed by three lodes. The eastern portion of the property has been worked to a great extent, returning 90 to 100 tons per month for a long time, and occasionally up to 300 tons per month. The property has been inspected by some of the best mining experts, and they estimate that 150 tons can be worked from the Goginan lode, and that the other two lodes will average 60 tons each per month. From 150 to 200 miners will be required to work it, who can be set on tribute at an average of 4l. 10s. per ton. Level Newydd has been worked by means of two adit levels. There is splendid silver-lead ore in it now, which will also be set on tribute. Considering that the eastern portion of the property has returned lead ore to the extent of about one million pounds, and that the western portion is nearly all virgin ground, and only tried enough to prove that it contains thousands of tons of ore, there is sufficient proof to guarantee that it is one of the safest properties for investment. There is a water-wheel and other mining plant already erected. There are also agents' and miners' houses, and over 30 acres of land. The whole of these, along with the water rights and the unexpired term of the lease—16 years—are conveyed to the present company for a reasonable sum. The mines are distant seven miles from the seaport and railway, but carriage can be effected cheaply. If worked at the rate indicated above the profits should be sufficient in two years to return the whole capital invested. It is, therefore, likely to be an exceptionally good speculation. The capital has been fixed at 18,000l., in 1l. shares.

BAMPFYLDE MINING COMPANY (Limited).—Parties who held shares in this company should subscribe for shares in the new company—the North Molton—which has been formed to continue the working of the mines. Unless they do so their interest in the property is lost. The new shares are issued to them fully paid-up, at the price of 5s. each, and they incur no further liability. The directors are going to hold on the mines, keeping expenses at the lowest ebb as long as possible until there is some little improvement in the metal trade, which it is to be hoped we shall not have to wait for much longer. When better times arrive it will be necessary to place more shares in order to commence operations on a large scale; but there being no question as to the intrinsic value of the mines, little difficulty is anticipated in this, more especially as the amount required would be comparatively small. Up to the present time 15,000 of the vendors' shares have been taken up.

BROXBURN OIL COMPANY (Limited).—It frequently happens that, when some combination of circumstances occur which threaten to overwhelm in ruin some special branch of industry, the determined struggle that ensues in the endeavour of the producer to hold his own results in the ruin being averted, and to the benefit not only of the producer but the consumer. Among metals, we believe the tin trade is the most important example at the present time of a struggle for life against foreign competition; and as that metal has began to recover, we may consider the home mines have a time of comparative prosperity approaching. However, it is regarding a more severe crisis the Scotch oil-makers have come through that we desire at present to give a description, assisted by some notes which appeared in the Scotsman, of Monday.—[This description will appear in next week's Journal.]

The following calculations show the yield per cent. on money invested at present prices in the shares named, based upon the last average yearly dividends being maintained. In coal and iron companies, Andrew Knowles and Sons would yield 11¾; Bolckow, Vaughan, and Company, A. 4½; ditto, B, 4½; ditto, stock, 5; Brown, Bayley, and Dixon, 6⅝; Charles Cammell and Company, 6½; ditto 6 per cent. debentures, 6; ditto 5 per cent. debentures, 5; Henry Briggs, A, 3⅞; ditto B, 4½; John Brown and Company, 8½; ditto 5 per cent. debentures, 5; Muntz's Metal, 7½; Parkgate, 5; Staveley, A, 5½; ditto B, 5½; ditto C or D, 4½; and ditto 5 per cent. preference, 5. In wagon companies shares, Birmingham would yield 7¾; British, 8½; Metropolitan, 7; North Central, 8½; Sheffield, 6½;

and Yorkshire, C, 7⅞. Tharsis Mine would yield 8⅞; Great Laxey, 7⅞; and St. John del Rey, 11½. Among miscellaneous investments, Earle's Shipbuilding may be mentioned to yield 9⅜; Milner's Safe, 6⅝; Price's Patent Candle, 7; Val de Travers Paving, 7½; and Young's Paraffin, 10¼.

NEW ZEALAND KAPANGA GOLD MINING COMPANY (Limited).—This property appears to be a rich one, as the whole quartz extracted hitherto has yielded about 5 ozs. of gold to the ton. From a very small piece of ground explored there has been upwards of 3000*l.* worth raised and sold. The mine captain in his last report states that the further expenditure necessary to cut the lode and thoroughly develope the property in a short time will not exceed 1500*l.* In order to provide this capital and meet present liabilities the directors are now issuing 5000*l.* in preference shares, which carry 20 per cent. interest, and in debentures carrying 10 per cent. interest. It is believed this expenditure will repay all interested for the outlay.

Capital. Per share.	Paid up.	Dividends. Rate per cent. Previous.	Last.	Description of shares.	Last price
				COAL, IRON, STEEL.	
£10	£8	£7†	£5	Aralston Coal (Limited)	5¼
10	10	4	4	Benhar Coal (Limited)	23s.
100	55	34s6d	25s	Bolckow, Vaughan, and Co. (Lim.)	A. 61
10	10	10	10	Cairntable Gas Coal (Limited)	5¼
10	10	4s April, 1876		Chillington Iron (Limited)	40s.
10	10	—	—	Clyde Coal (Limited)	40s.
25	20	10s Dec., 1874		Ebbw Vale Steel, Iron, and Coal (Lim.)	62s. 6d.
10	7	nil	nil	Fife Coal (Limited)	75s.
10	10	nil	nil	Glasgow Port Washington Iron & Coal (L)	50s.
10	10	—	—	Ditto Prepaid	47s. 6d.
10	10	—	—	Lochore and Capledrae (Limited)	17s. 6d.
10	10	nil	nil	Marbella Iron Ore (Limited)	25s.
10	10	nil	nil	Monkland Iron and Coal (Limited)	27s. 6d.
10	10	5	4	Ditto Guaranteed Preference	47s. 6d.
100	100	nil	nil	Nant-y-Glo & Blaina Ironworks pref. (L)	16
6	6	nil	nil	Omoa & Cleland Iron & Coal (L. & Red.)	6s.
1	1	15	15	Scottish Australian Mining (Lim)	40s.
1	10s.	15	15	Ditto New	20s.
Stock	100	nil	nil	Shotts Iron	90
				COPPER, SULPHUR, TIN.	
4	4	—	—	Canadian Copper and Sulphur (Lim.)	6s. 6d.
10	7	72s 6d	35s	* Cape Copper (Limited)	27
1	1	7½	2½	Glasgow Caradon Copper Mining (Lim.)	19s.
1	15s.	7½	2½	Ditto New	13s. 6d.
10	9¾	nil	nil	Huntington Copper and Sulphur (L.)	15s.
4	4	—	—	Panulcillo Copper (Limited)	25s.
10	10	6†	6†	Rio Tinto (Limited)	67s. 6d.
20	20	7	7	Ditto, 7 per cent. Mortgage Bonds	15
100	100	5	5	Do. 5 p.ct. Mor. Deb. (Sp. Con. Bds.)	67
10	10	20	17½	Tharsis Copper and Sulphur (Lim.)	21¾
10	7	20	17½	Ditto New	14⅝
1	1	—	—	Yorke Peninsula Mining (Limited)	3s. 9d.
1	1	—	—	Ditto, 15 per cent. Guaranteed Pref.	12s. 6d.
				GOLD, SILVER.	
1	1	—	—	Australasian Mines Investment (Lim.)	5s.
5	5	10s.	10s.	Richmond Mining (Limited)	7⅜
				OIL.	
10	8½	—	—	Broxburn Oil (Limited)	13½
10	7	5	5	Dalmeny Oil (Limited)	7
1	1	25	15	Oakbank Oil (Limited)	43s. 6d.
1	8s.	—	15	Ditto	11s.
10	10	7½	2	Uphall Mineral Oil (Limited) "A"	6¾
10	10	—	—	Ditto "B" Deferred	10
10	8½	17½	17½	Young's Paraffin Light & Mineral Oil (L)	14/ 8s 9d
				MISCELLANEOUS.	
50	25	5	6	London & Glasgow Engineering & Iron Shipbuilding (Limited)	20
7	7	10	5	Phospho Guano (Limited)	6
10	10	6	5	Scottish Wagon (Limited)	7½
10	4	6	5	Ditto New	50s.

† Interim. † Per share. * For six months of 1878.

NOTE.—The above lists of mines and auxiliary associations are as full as can be ascertained. Scotch companies only being inserted, or those in which Scotch investors are interested. In the event of any being omitted, and parties desiring a quotation for them, and such information as can be ascertained from time to time to be inserted in these lists, they will be good enough to communicate the name of the company, with any other particulars as full as possible.

J. GRANT MACLEAN, Stock and Share Broker.

Post Office Buildings, Stirling, May 8.

SUCCESSFUL FLOATING OF THE CONSOLIDATED AMADOR VOLCANO HYDRAULIC GRAVEL MINES ON THE FRENCH MARKET.

OPINION OF LEADING PARIS PAPERS.

The Journal des Débats in its financial article, signed by its City Editor, M. Jules Paton, speaks as follows in regard to the present issue of 5200 shares of 500 fr. of the Compagnie des Mines d'Or d'Amador Volcano, which have been offered by public subscription for 600 fr., with 100 fr. premium, by Messrs. Bouvier Frères:—

Business has been active in gold mines on both the banking and regular board market. The announcement of the subscription to the Gobi Mines of Amador Volcano has been received with a marked attention. In fact, it is an undertaking already in existence, provided with powerful means of action, and which promises the best results in the present as well as in the future. We have good news of the subscription. We should state, if we are well informed, that the present issue had the advantage of not exciting a speculative market with a more or less considerable premium. Serious subscribers fear this kind of excitement, which is not always created in good faith. It is after the subscription has been closed that the rarity of titles offered on the market justifies better prices. The only remaining stock issue for April, that of the Mines d'Or de Volcano, has been perfectly successful. Subscriptions will be closed to-morrow, May 1. The success is certain.

The Messager de Paris, one of the most important organs of the financial Press, has devoted a long article to the study of the Mines d'Or d'Amador Volcano, to which it predicts the brightest future:—

We should, in conclusion, says the Messager de Paris, call the attention of our readers to the composition of the board of directors. The names so honourably known of Messrs. Turgan, de Parville, Renevey, Baron de Watteville, and Alb. Rabou, are an incontestible guarantee of the enterprise, and will not fail in inspiring in subscribers a deep feeling of security and confidence in regard to the good management of the interests of the company.

On the same subject we find the following in the journal L'Estafette:—

The auriferous land and ditches are the property of the Consolidated Amador Volcano Hydraulic Company, which has among its French associates a large number of the most respectable and prominent gentlemen. Among the shareholders we find the names of Messrs. A. Bapst, H. Gueneau de Mussy, A. Barbier, Saint Marc Girardin, Gustave Bapst, Paul Poisson, Charles Bapst, de Castro, and others. The descriptive and technical report upon the Volcano Mines has been made by M. Jules Berton, late Vice-Consul of France in California, and was addressed by that gentleman in the course of last year to the Director of the French Mint in Paris, in conformity with instructions which he had received from M. Léon Say, Ministre des Finances. The French company has its bye laws deposited with its notary, and all its capital stock subscribed. It has secured sufficient means for acquiring the balance of stock belonging to the American company. The board of directors of the French company is mostly composed of scientific gentlemen well acquainted with mining industry. We shall in our next issue give the results of the public subscription to the 5200 shares offered at 600 fr. each by the Compagnie des Mines d'Or d'Amador Volcano, out of the 10,000 shares of 500 fr. which constitute the entire capital stock of the French company.

MINING IN UTAH.—The Horn Silver Mine, known as the Bonanza Mine, at Frisco, Beaver county, South Utah, has been purchased by New York parties and incorporated into a stock company, known as the Horn Silver Mining Company, with a capital of $10,000,000, divided into 400,000 shares, par value $25 each. The president of the company is Mr. Charles G. Francklyn, of the Cunard line; vice-president, Mr. Frank G. Brown; secretary, Mr. William S. Hoyt. The present office is at the office of Mr. F. G. Brown, 90, Broadway. This is the mine in which is the large deposit of ore from the surface down to 300 ft., of which estimates have been made by experts, run at the lowest at $17,000,000 net, after paying costs of extraction, smelting, and refining. Its contact vein of an average width of 50 ft. has the hanging wall of trachite and the footwall of quartzite. All the mineral between the walls is ore. The above estimate of $17,000,000 is based on measurements of ore in sight above the present lowest workings, which are 300 ft. from the surface, and inside the lines of the present drift. The company are producing bullion, having two smelters of four stacks, and a refinery. This is the mine to which the Union Pacific are extending the Utah Southern Railroad. The stock, we learn, is now selling at $17·50 per share, the first offering of 40,000 shares at $15 having been closed out in two days. We will place before our readers in a later issue a full detailed description of this wonderful mine.—*Mining Record*, New York, April 12.

TRANSMITTING MOTION TO STONE-BREAKERS.—With a view to the production of means for transmitting motion whereby the strain upon or power required from the prime mover is reduced, and the working of the machine more easily effected, Mr. W. H. BAXTER, of Leeds, has patented an invention which is particularly applicable to machines known as Blake's stone-breaking machine, but it is also applicable as an intermediate arrangement for transmitting motion between prime movers and other machinery, reducing the power required from such prime mover in working the machines. Blake's stonebreaking machine is actuated directly from a crank or eccentric, and consequently requires a large amount of power to move it when working. In his arrangement he employs between the eccentric or crank, a radial arm having one rod coupling the outer end to the toggles, such toggles being of ordinary construction, and at or near the same point of connection on the radial arm he couples another connecting rod, which is engaged with the crank or eccentric. The crank or eccentric imparts when in motion a radial reciprocating motion to the radial arm, moving it thereby by preference right and left at its top centre, which movement imparts the desired motion to the toggles of the stone-breaking machine. A wedge-like movement being produced by the arm moving in the manner described, much less power for working the machine is required than when the ordinary direct action is employed for transmitting motion. This arrangement of radial arm may be employed or transmitting motion to other machinery.

Registration of New Companies.

The following joint-stock companies have been duly registered:—

THE PEN-YR-ORSEDD LEAD MINING COMPANY (Limited).—Capital 12,000*l.*, in shares of 1*l.* The purchasing or otherwise acquiring lands and hereditaments, rights of mining, quarrying and searching for lead and other minerals in lands in Northop, Flint; also the purchasing or acquiring the lands adjoining thereto for the purpose of carrying on mining and quarrying operations, and making merchantable and disposing of lead and other mineral substances. The subscribers (who take 10 shares each) are—D. Bowen, Pembroke, clergyman; G. H. Watkyn, Holywell, land agent; J. Lloyd, Mold, wine merchant; E. J. Bartlett, 30, Great St. Helen's sharedealer; J. Owen, Holywell, bank manager; W. Parry, Holywell, wine merchant; J. Danker Reading, gentleman.

PINOS ALTOS (MEXICO) MINING COMPANY (Limited).—To acquire the business, mining rights, machinery, &c., mentioned in an agreement made between J. G. Buchan Hepburn, Joseph Waithman and W. M. Kerr, and the Pinos Altos (Mexico) Mining Company (Limited), to carry into effect the said agreement, and to acquire any other mines, mining rights, tracts of land, setts, and claims in the district of Pinos Altos, or elsewhere, in Mexico. To carry on the business of mining in that country, and to deal with the property of the company. To do all acts necessary for obtaining for the company a legal status in Mexico, or any other country in which business may be carried on. The subscribers are—T. B. Hepburn, Smeaton Hepburn, baronet, 250; D. M. Horne, Payton House, Warwickshire, M.P., 250; A. B. Hepburn, 7, Bury-street, barrister, 250; W. T. St. Aubyn, Weybridge, gentleman, 250; W. Sharp, 29, Albert Gate, gentleman, 250; J. Waithman, 23, Bentinck-square, gentleman, 1; W. M. Kerr, 38, Hogarth-road, mechanical engineer, 1. The first directors shall be Sir Thomas B. Hepburn, Bart.; General Sir Archibald Little, K.C.B.; Capt. D. M. Horne, M.P.; Messrs. W. Sharp, A. B. Hepburn, J. G. B. Hepburn (managing director), and H. de Lindeth Waithman, to continue until 1883. Qualification 500 shares.

HODGSON AND STEAD (Limited).—Capital 40,000*l.*, in shares of 25*l.* and 100*l.* each. The carrying into effect an agreement for the purchase by the company of land in Salford, together with the iron-foundries, machine works, and buildings known as the Egerton Ironworks, and the cottages erected on the said land, and to carry on the business of engineers, millwright, iron-founders, &c. The subscribers (who take one share each) are—C. Hodgson, Manchester; W. Hodgson, Salford; J. Needham, Salford; H. A. Allford, Nottingham; C. Hill, Nottingham; J. A. Fisher, Derby; R. H. Potter, Manchester.

ZENITH BUILDING AND PROPERTY INVESTMENT SOCIETY (Limited).—Capital 10,000*l.*, in shares of 5*l.* To purchase, sell, and make loans and advances upon property in the United Kingdom. The subscribers (who take 25 shares each) are—C. Squier, New Southgate; H. Moxon, 38, Manor-place; C. Brewster, East Dulwich; T. C. Jefferies, 29, Lordship-lane; J. E. Patmore, New Southgate; A. Patmore, Upper Tollington Park; D. Squier, Tollington Park.

JOHN ROBERTS AND COMPANY (Limited).—Capital 5000*l.*, in shares of 10*l.* To purchase the interest of J. Roberts in a certain timber-yard and manufactory in Shrewsbury, and the goodwill of the business, stock-in-trade, plant, &c., and to carry on the business of British and foreign timber merchants in all its branches. The subscribers are—H. C. Clarke, Shrewsbury, 5; T. Groves, Shrewsbury, 2; J. Metcalf, Shrewsbury, 3; J. F. Smith, Shrewsbury, 10; T. W. Thompson, Shrewsbury, 5; W. Lewis, Shrewsbury, 10; J. Crane, Shrewsbury, 1; H. Davies, Shrewsbury, 5.

THE LIVERPOOL AND SOUTH-WEST LANCASHIRE CRICKET GROUND COMPANY (Limited).—Capital 12,500*l.*, in shares of 25*l.* To acquire land in the neighbourhood of Liverpool suitable for cricket. The subscribers are—Lord Sefton, Croxteth Hall, 20; T. D. Hornby, Liverpool, 1; C. Laughton, Liverpool, 1; D. Cunningham, Liverpool, 1; A. Heywood, Liverpool, 10; W. T. Pears, Liverpool, 4; R. Gladstone, Liverpool, 4; J. C. Fraser, Liverpool, 4.

THE BEEF WINE COMPANY (Limited).—Capital 6000*l.*, in shares of 5*l.* To manufacture and sell a certain patent medicine known as "Beef Wine." The subscribers are—F. G. Chant, 36, Woodstock-road, 1; E. Pollock, 5, Bond-court, 1; H. D. Mytton, 5, Bond-court, 1; W. H. M. Dalston, New Southgate, 5; C. J. Strick, 6, Stockwell Park road, 1; W. D. Dickeson, 16, Everleigh-street, 1; J. Hezeldine, Wool Exchange, 1.

THE BRIDLINGTON QUAY NORTH SEA FISHING COMPANY (Limited).—Capital 12,000*l.*, in shares of 5*l.* The carrying on the trades of sailing and fishing shipowners. The subscribers (who take one share each) are—W. H. Parrett, Bridlington; R. M. Beauvais, Bridlington; T. Prickett, Bridlington; J. Pickaby, Bridlington; H. Marshall, Bridlington; R. Medforth, Bridlington; J. Raynor, Bridlington; J. W. Postill, Bridlington; L. Mainprize, Bridlington; E. K. Harding, Bridlington.

THE "DURABLE" PRINTERS' ROLLER COMPANY (Limited).—Capital 25,000*l.*, in shares of 10*l.* To purchase or otherwise acquire the business carried on by B. Lawrence and P. Lawrence, at the Viaduct Roller Works, Farringdon-road. To carry on the business, and generally that of printers' roller manufacturers, in all its branches. The subscribers (who take one share each) are—E. T. Marler, Dulwich; P. Lawrence, Brighton; R. C. Baxter, Reigate; R. A. Baxter, Reigate; J. B. Howell, Cock-lane; T. F. Morris, Hatton Garden; J. T. Pickering, New Cross.

TRAMWAYS COMPANY OF ITALY (Limited).—Capital 250,000*l.*, in shares of 10*l.* To acquire the undertaking of any tramway, omnibus, railway, telegraph, steamships or other company or business in any part of the world, and to work and carry on any such business. The subscribers (who take one share each) are—A. J. Lambert, Lancaster Gate; E. W. Ruch, Mayfield; C. J. Reedy, Linkfield; R. Palmer, Kenmare; E. Bellamy, 14, Buckingham-street; E. C. Price, Stoke Newington; A. A. Lumb, 2*a*, Granville-place.

THE BARBADOS RAILWAY COMPANY (Limited).—Capital 150,000*l.* in shares of 5*l.* To construct, equip, and work railways in Barbados, in compliance with the laws of said island. The subscribers (who take one share each) are—W. Munro, Taunton; F. M. Alleyne, 2, Stone Buildings; D. C. Da Costa, 6, The Terrace, Kensington; E. Chambers, 4, Mincing-lane; F. Lubbock, 16, Leadenhall-street; T. J. Wilkinson, 34, Great Tower-street; E. D. C. Da Costa, 6, The Terrace, Kensington.

GLANDOVEY SLATE COMPANY (Limited).—Capital 20,000*l.*, in shares of 1*l.* To acquire the right of working and extracting slate from land named Dynin, in Llanfihangel Generflyn, Cardigan, and to carry on the business of slate and slab quarrymen and miners in all its branches. The subscribers (who take one share each) are—W. F. Richardson, 11, Queen Victoria-street; J. W. Burrows, 47, Fleet-street; J. Cox, 9, Gresse-street; R. W. Tubby, 124, Palmerston-road; J. S. Nowlan, 2, Hadlow-place; H. E. Millington, 7*a*, Goding-street; W. H. Talbot, Lee.

THE KIOSK AND COFFEE STALL COMPANY (Limited).—Capital 10,000*l.*, in shares of 5*l.* To carry on the manufacture, preparation, purchase, sale, and supply of such refreshments, food, and beverages as shall not be intoxicating, also tobacco and snuff, and to fit kiosks, stalls, stands, shops, &c. The subscribers (who take one share each) are—W. Cowper Temple, 15, Great Stanhope-street; A. K. Grosvenor, 35, Park-street; W. T. Holdsworth, 5, Cornwall Gardens; A. H. Maude, 9, Onslow-square; S. Gedge, Mitcham Hall; J. H. Kennaway, 14, Hyde Park-square; N. J. K. Shuttleworth, 28, Prince's Gardens.

THE MONTE VIDEO WATERWORKS COMPANY (Limited).—Capital 400,000*l.*, in shares of 20*l.* The acquisition of the Monte-Video Waterworks, and all concessions already or hereafter to be granted, and carrying on the business of a water company in all its branches. The subscribers (who take one share each) are—T. W. Perry, Stoke Newington; J. Beer, 27, Portland-place; F. I. Isaac, 22, Great Winchester-street; G. H. Duncan, 4, Copthall Buildings; A. Isaac, 22, Great Winchester-street; W. H. Duncan, St. Stephen's Chambers; J. Anderson, 5, Copthall Buildings.

THE ENGLISH AND AMERICAN COMMERCIAL AGENCY (Limited).—Capital 20,000*l.*, in shares of 10*l.*, and ten founders' shares of 1*l.* To act as agents or representatives of any Governments or State, and to carry on the business of commission agents, merchants, and consignees. The subscribers (who take one share each) are—J. Andrew, Tollington Park; J. Davies, 70, Cornhill; J. F. Copeland, 41, Canonbury Park North; T. Sissons, East Dulwich; A. Page, New Cross; E. M. Pigram, 39, Upper Tollington-road; G. J. Ridley, 103, Cannon-street.

CALLIE'S PARCEL EXPRESS COMPANY (Limited).—Capital 5000*l.*, in shares of 5*l.* The conveyance of goods, furniture, &c., in carts, waggons, vans, and other carriages. The subscribers (who take one share each) are—J. P. Bath, Liverpool; F. Cox, Liverpool; J. Callie, Liverpool; E. Heaton, Liverpool; J. Marples, Liverpool; J. W. Phillips, Liverpool; C. A. Scrivener, Liverpool.

THE COAL TRADE.

Mr. J. R. Scott, the Registrar of the London Coal Market, has published the following statistics of imports and exports of coals into and from the port and district of London by sea, railway, and canal during April, 1879:—

IMPORTS.

By sea.	Ships.	Tons.	By Railway and Canal.	Tons	c.
Newcastle	187	117,958	London & North-Western	129,748	1
Seaham	26	19,477	Great Northern	92,215	0
Sunderland	70	50,035	Great Western	89,338	10
Middlesborough	3	680	Midland	161,595	0
Hartlepool	68	25,787	Great Eastern	49,981	4
Scotch	12	5,782	South-Western	12,064	13
Welsh	11	5,334	London, Tilbury, & Southend	22	0
Yorkshire	30	9,219	South-Eastern	1,597	1
Small coal	3	1,695	Grand Junction Canal	287	10
Cinders	1	38			
Total	361	299,886	Total	529,838	19
Imports—April, 1878	341	214,694	Imports during April, 1878	461,593	1

Comparative Statement, 1878 *and* 1879.

By Sea.	Ships.	Tons.	By Railway and Canal.	Tons.	c.
Jan. 1 to April 30, 1879	1799	1,220,678	Jan. 1 to April 30, 1879	2,190,235	9
Jan. 1 to April 30, 1878	1752	1,096,886	Jan. 1 to April 30, 1878	1,378,578	0
Increase—1879	47	123,792	Increase—1879	311,657	0

EXPORTS.

Railway-borne coal passing *in transitu* through district	Tons	78,702
Sea-borne coal exported to British possessions, or to foreign parts, or to the coast	Tons 55,592	
Ditto, sent beyond limits by railway	18,435	
Ditto, by canal and inland navigation	1,866	= 75,893
Railway-borne coal exported to British possessions, or to foreign parts, or the coast	48,633	
Ditto, by canal and inland navigation	34	= 48,667
Sea-borne coal brought into port and exported in same ships		194
Total quantity of coal conveyed beyond limits of coal duty district during April, 1879		203,456
Ditto, April, 1878		188,766

Comparative Statement, 1878 *and* 1879.

Total distribution of coal from Jan. 1 to April 30, 1879	777,805
Ditto, Jan. 1 to April 30, 1878	745,625
Increase in the present year	31,880

General Statement, 1878-1879.

Increase in coals imported by railway	311,657	
Increase in coals imported by sea	123,792	= 435,449
Less increase in coals exported		31,880
Total increase in trade within London district during present year.		403,569

THE WELLS' BALANCE ENGINE.

An entirely novel form of engine is at present being manufactured by Mr. J. R. WELLS, of Liberty-street, New York, the smooth working of which may be judged of from the fact of their having made 1000 revolutions per minute without being fastened to the floor, and 900 revolutions per minute without caps and binders on the shaft. The engine has two pistons in one cylinder, and the steam is admitted at both ends of the cylinder simultaneously, forcing both pistons to the centre. Steam is then admitted in the centre between the two pistons, forcing them back to the ends of the cylinder, completing the revolution. The middle piston rod moving through the stuffing box in the front piston head is packed with metallic rings automatically adjusted with springs. It is pointed out that by using two pistons in one cylinder the area and pressure are doubled. As the two pistons move to and from each other at equal speed, they jointly traverse a cylinder of a given length in half the time required for a single piston to traverse it at the same speed; thus the same speed per foot of piston in the balance engine transmits double the power transmitted by a single piston. By increasing the speed of the double piston 50 per cent. (which can be done because of its perfect balance) it is claimed that the engine will transmit three times the power obtainable from the ordinary engine with a given size of cylinder. Several of the new engines are in use driving dynamo-electric machines, connected directly, and making 700 revolutions per minute with a perfectly steady motion. The first cost is less than that of any other engine of equal power, it consumes less fuel for a given duty, gives high speed of shaft and steady motion, and it weighs only one-fourth as much as other engines of equal power, and, therefore, can be handled and transported at one-fourth the cost. The great difference in its weight arises from the fact that the force of the steam is confined within the cylinder, and is not transmitted to the bed-plate or frame; hence the latter can be made very much lighter, and the weight of the fly-wheel is also reduced because of its increased velocity and momentum.

The engine can be placed in any part of a building where the floor is strong enough to support its weight; the fastening is required to be only sufficient to resist the traction of the driving belt or the strain from the driving gear. All the steam force on the cranks being exerted in turning the shaft, there is no strain on the frame or foundation. It occupies about half the usual space, having a double crank, with the shaft in the centre. Each crank arm is only half as long as the crank of a single piston engine of equal length of cylinder. This reduces by one-half the angle of the connecting rod, which shortens the engine about one-fourth, and in an engine of equal power more than one-half. The weight of the steam force on the pistons being balanced, the main shaft bearings are entirely relieved of all the consequent friction, and only the friction from the actual amount of power transmitted remains on the crank pin; therefore, high speed of shaft can be obtained without heating or jarring. It is claimed, moreover, that increased durability is also gained by its ease of action owing to its entire exemption from unequal strains and jarring. The main bearings having only the weight of the moving parts to support will not heat and cut, and the pressure being always uniform the wear will be equal in the whole circuit. The force being applied on opposite sides of the shaft, both crank arms travelling in the same direction, the thrust of the single piston is avoided, which greatly lessens the liability of breaking the cranks or shaft; the force being balanced on opposite crank arms, there is no strain whatever on the crank arms or shaft except the actual amount of work being done.

EPPS'S COCOA.—GRATEFUL AND COMFORTING.—"By a thorough knowledge of the natural laws which govern the operations of digestion and nutrition, and by a careful application of the fine properties of well-selected cocoa, Mr. Epps has provided our breakfast tables with a delicately flavoured beverage which may save us many heavy doctors' bills. It is by the judicious use of such articles of diet that a constitution may be gradually built up until strong enough to resist every tendency to disease. Hundreds of subtle maladies are floating around us ready to attack wherever there is a weak point. We may escape many a fatal shaft by keeping ourselves well fortified with pure blood and a properly nourished frame."—*Civil Service Gazette*. Sold only in packets labelled—"JAMES EPPS and Co., Homœopathic chemists London."

PUNCHING AND SHEARING METALS.

The invention of Mr. DAVID BRICKNER, of New York, United States, consists in the combination of a hand lever with a heavily weighted pendulum hung on a pivot, and moving an eccentric whose rod is connected with the slide of a punching, shearing, or stamping machine. The invention also consists in a novel device for stopping the action of the slide of the machine while the pendulum is permitted to oscillate. The object of the invention is to provide a simple and powerful machine to be operated by hand or by means of a treadle for punching, shearing, or stamping metals and other materials. According to this invention the bed plate of the machine is provided with two ears, one at each side of an opening in the bed plate, which receives the upper bifurcated end of the pendulum, which is hung upon a pivot pin passing into the ears. To the lower end of the pendulum is secured a heavy weight, which may be made adjustable on the pendulum, and may be moved near the pivot for light work. At the upper end of the pendulum is an arm extending at one side, which is connected by a link with a hand lever. The link is connected to the arm and lever by pins that pass through the link, and are secured by nuts. The hand lever is fitted in a support, that is a lever fulcrumed on one of the side bars of the machine. The hand lever is held by straps that are formed upon one side of the support, and it can be inserted or removed as desired.

The bed of the punching machine is supported upon legs bolted to the bed plate, and it is additionally braced by the side bars which are also bolted to the bed. Between the two curved standards that are secured to the bed is fitted a slide, which as well as the curved standards is slotted to receive a bar that is connected by rods with a cross bar below the bed. A rod is connected by means of a right and left hand screw with the csoss bar, the end of the rod and the bar being apertured and threaded for receiving the screw. By turning the screw the distance between the upper and lower die may be varied. The slide and the bed are provided with the usual devices for holding punches, shear blades, or dies. The lower end of the screw rod is formed as a strap that is around an eccentric, which is keyed to the pivot pin or axis of the pendulum. There is a ratchet wheel also keyed to the pin and a pawl hung upon the pendulum, which pawl engages with the teeth of the ratchet wheel, being kept in contact therewith by a flat spring. A lever is fulcrumed on the bed plate in such position that its inner end passes beneath a lip formed on one side of the pawl, so that by depressing the outer end of lever the pawl is raised and disengages from the ratchet wheel. This device forms a stop motion by which the movement of the slide can be instantly arrested, while the pendulum continues to vibrate.

By moving the hand lever up and down the pendulum is oscillated, and the pawl acts at each reciprocation of the pendulum to turn the ratchet wheel and eccentric, and thereby move the slide up or down, according to the position of the eccentric. The slide is thereby moved with great force, so that punching, shearing, or stamping which has been hitherto considered too heavy for hand work may be readily done by this machine. For doing light work a treadle may be substituted for the hand lever. It will be hung on the frame of the machine in a convenient position, and the weight will be lighter than when a hand lever is used.

MACHINES FOR SEPARATING ORES.

The object of the invention of Messrs. HASTINGS and GODDARD, of Palmer, Massachusetts, is to make a machine which will treat finer and coarser particles with equal success, which may be easily adjusted to operate upon different grades, and which shall be simple in construction, be easily oiled, and have all its wearing surfaces protected from dust. The invention consists in the combination of the hollow post provided with an air inlet pipe, and perforated in its upper part, the vertical shaft, the three gear wheels, the two collars, and the hollow cylinder provided with radial blast pipes, with each other; in the combination of the feed cone, the adjustible feed cylinder, and the ore bed, with the hollow post provided with perforations, the bearing, and the hollow cylinder; in the combination of the obtuse angled or radially projecting elbow pipes provided with top slits, the straight radial pipes having their outer parts bent upward, inward, inclined forward, and provided with side slits, and the guide aprons with the hollow cylinder and the ore bed; and in the combination of the outer inverted cone provided with the vertical flange, the discharge pipes, and the chutes, and the inner inverted cone provided with the discharge pipe and the chutes, with the hollow post to receive the separated ore as it is blown from the ore bed. The machine is mounted upon a base or pedestal, to the centre of the top of which is firmly secured the lower end of a hollow cylindrical post. The ends of the hollow post are closed by bearings, in which revolves a vertical shaft. To the lower end of the shaft is attached a bevel gear wheel, the teeth of which mesh into the teeth of a bevel gear wheel upon a horizontal shaft revolving in bearings attached to the base, and motion is given to it from any convenient power. If desired the horizontal shaft may be omitted, and the driving power be connected directly with the vertical shaft. To the upper part of the vertical shaft is secured by a set screw or other convenient means a gear wheel of such a size as to work freely within the hollow post, and the teeth of which mesh into the teeth of a small gear wheel which projects through a slot in the side of the hollow post, and is pivotted to a collar fitted upon the said post, and secured in place by a set screw or other convenient means. The teeth of the small gear wheel also mesh into teeth formed upon the inner surface of the upper part of a hollow cylinder, whose inner surface fits just below the gear teeth upon the outer surface of the collar above mentioned, which thus serves as its upper bearing.

The lower part of the cylinder is contracted to fit upon the hollow post, and its lower end rests upon a collar fitted upon the said hollow post, and secured to it by a set screw or other suitable means. With the lower part of the hollow post is connected the inner end of a pipe, the outer end of which is designed to be connected with an air pump, a fan blower, a reservoir of condensed air, or other means of supplying a steady blast of air. The pipe should be provided with a stop-cock or valve, to enable the air blast to be regulated as may be required. A cavity of the hollow post and the cavity of the cylinder above mentioned are connected by perforations formed through the walls of the said post just below the upper collar. Perforations are also provided in the walls of the cylinder connected with the inner ends of two sets of radial pipes, which alternate with each other. The outer parts of the one set of pipes are bent to the rearward at a obtuse angle, and have longitudinal slits formed in their upper sides, through which the blast escapes against the under side of the ore bed, which is composed of wire gauze. The other set of pipes at the outer edge of the ore bed are bent upward and then inward horizontally, and are inclined forward and have slits formed in their sides. The bent parts of these pipes are made in separate pieces connected by air-tight couplings, so that their ends may be adjusted to give the desired direction to the blast.

The wire gauze of the ore bed is made ring-shaped, and is attached to a ring-shaped frame, which is attached to the base of a cone, which is recessed to receive the upper part of the said cylinder, the upper part of the hollow post, and the conical upper end of the bearing, upon which the said cone rests. The cone is secured to the hollow post by a set screw or other suitable means. In the apex of the cone in line with the vertical shaft is formed a hole, in which is secured the lower end of a hollow screw, the upper end of which is closed by a detachable cap. Upon the screw is screwed a long nut, the lower end of which is formed solid with or is rigidly attached to the centre of a cross-bar, the connection being strengthened by a web or angle brace. The ends of a cross-bar are formed solid with or are firmly attached to the upper edge of a hollow cylinder, the lower edge of which extends down to, or nearly to, the ore bed at the outer edge of the base of the cone upon the hollow post. The ore to be operated upon is introduced into the space between the cone and the cylinder, and passes beneath the lower edge of the cylinder to the ore bed, the rapidity of the feed being regulated by turning the cylinder down or up as required.

With this construction as the pipes are carried around by the gearing the vertical blast from the slits in one set of pipes raise the ore from the different parts of the ore bed in succession, move it a little towards the outer edge of the said ore bed, and allow it to drop. The lighter particles of the ore will rise higher than the heavier particles, and will fall slower, so that they will always be above the said heavier particles. The lighter part of particles of the ore as they rise come into the horizontal blast from the slits of the other set of pipes, and are blown against a vertical flange formed upon or attached to the upper edge of an outer inverted cone, by which they are guided into the space between the said outer cone and an inner cone, and pass out through discharge pipes into some suitable receiver. In the space between the two hollow cones are placed inclined chutes or partitions to guide the ore to the discharge pipes. The heavier particles of ore drop from the outer end of the ore bed into the cavity of the inner cone, and also pass out through discharge pipes, towards which the ore is guided by chutes or guides placed in the cavity of the inner cone, through the centre of which the hollow post passes. The hub of the chutes is extended upward, so as to prevent any dust from flying against and adhering to the oil surface of the hollow post. The hollow cones rest upon and are supported by a collar placed upon the hollow post, and secured to it by a set screw or other suitable means.

SMELTING AND OTHER FURNACES.

In constructing furnaces for smelting iron ore, Mr. JAMES NOAD, of Plaistow, forms them in such manner that the fuel together with the ore is fed into the top of the furnace as usual, but the draft in place of being upwards he leads from the bottom of the furnace by a flue or channel sloping somewhat downwards to a chamber in which the slag and molten metal from the furnace is free to collect, and from which they can be drawn off from time to time as desired or can be left there for further treatment. From the top of the chamber proceeds a tall chimney for producing the required draught in the furnace or furnaces leading to the chamber. By preference he employs two furnaces on opposite sides of the chamber, so that the heated gases passing from them to the chamber shall impinge against one another below the bottom of the chimney at the centre of the furnace. Air for supporting combustion is admitted through openings around the sides of the furnaces, and several tiers of openings at different levels may be formed at which air can be admitted or which can be closed as desired.

When the ores or fuel contain sulphur or other prejudicial materials which it is desirable to prevent the metal being contaminated with, he forms an outlet flue from the side of the furnace at some distance from its bottom direct to the chimney through which the products of the combustion of such materials which burn at a lower temperature than is required for the melting of the metal can be passed directly into the chimney before the metal and fuel have descended to the lowest part of the furnace where the highest heat is maintained, and where the metal is fused and allowed to pass down with the draught to the receiving chamber at the bottom. These outlets from the sides of the furnace direct to the chimney he makes at a higher level than some of the tiers of openings for admitting air to the furnaces for supporting combustion. The openings from the sides of the furnaces to the chimney can be closed when from the nature of the fuel and ores they are not required to be used.

Similar furnaces to those described can be used for smelting other ores and for heating ovens or chambers in which metals or other materials are to be heated or melted, the furnaces being formed so that the heated gases from them are led from the bottom through a flue leading somewhat downwards to a receiving chamber in which the slag can accumulate and be drawn off from time to time, and from which chamber the heated gases from the furnace can rise into the oven or chamber to be heated. Two rows of such furnaces may be used on opposite sides of the chamber or oven to be heated, or they may be on one side only as desired.

INDESTRUCTIBLE TELEGRAPH CABLE.

There are no doubt many cases in which the use of the telegraphic communication would be a great advantage, although from the liability of the cables to injury its adoption has been impracticable, and for such applications the invention of Messrs. Berthoud and Borel, of Neuchatel, just patented in this country through Mr. E. de Pass, of Fleet-street, would appear to be of especial value. The invention consists in applying the property possessed by a heterogeneous ingot submitted to a rolling or to a drawing through the drawplate of being lengthened without changing the proportions or relative position of the different materials of which it is composed, and in applying this property to the manufacture of telegraph cables in which the insulation of the conductor is produced by means of substances which could not hitherto be employed for this purpose. For the manufacture of these cables they prepare a normal ingot, the different materials of which are in order and quantities proportional to those of the final cable to be obtained. These cables must necessarily have for outer envelope or covering a hollow metal cylinder to protect the insulating material as well as the conductor, both of which are inside thereof. Suppose that a cable is to be manufactured having outside diameter of about 5-16th in. thickness of the metal forming the protective envelope or covering 1-24th in., thickness of the insulating material 1-12th in., and the rest 1-12th in. for the diameter of the conductor. Then, to obtain a telegraph cable having these dimensions it would be necessary to take an ingot having, for example, the following dimensions. The protective tube made of chosen metal for the outer envelope or covering should be $3\frac{1}{2}$ in. outside diameter, with a thickness of about $\frac{3}{8}$ in. The cylinder of soft metal chosen for the conductor should have a diameter of about $\frac{3}{8}$ in.; and, lastly, the space unoccupied between the conductor and the protective tube should be filled by the insulating material selected, which if in powder must be rammed in. The ingot thus prepared is passed through a draw-plate until it be reduced to the desired diameter of about 5-16th in., which would take place when it be lengthened to 100 times its normal length.

The materials employed for insulation may be fusible or in powder. Amongst the former material Messrs. Berthoud and Borel cite resin or colophony, sulphur, and gum lac, and amongst the latter pulverised glass, pulverised silicious stones, and asbestos, as well as mixtures of these materials. These cables may also be constructed in such manner as to obtain several concentric conductors. For this purpose a normal ingot is formed of several metal pipes or tubes, placed one within the other, and separated from each other by a layer or stratum of insulating material. These cables offer particular advantages for the phenomena of induction. They also manufacture cables composed of an outer envelope or covering of soft metal, such as lead or tin, and having as conductor copper, iron, or any other hard metal, the insulation of which would be effected by means of materials, melted or in powder, which could not be utilised without metallic protective tube.

This is thus effected:—As fast as the leaden tube is made by the usual process (lead pipe press) the conducting wire is introduced into the empty space of the tube by piercing a small central opening, and the insulating material in its liquid or powdered state is introduced at the same time through lateral openings. If the insulating material be in a liquid state care must be taken to pass the tube, coming out of the press or machine in which it is made, into a bath of cold water, so as to solidify the insulating material before winding the cable on to a core or drum. These cables can also be constructed with several conductors by placing in the primitive ingot several cylinders of metal, which compose the conductor, and which would be separated one from the other by a layer or stratum of insulating material, but in this case, the conductors being parallel, they would suffer much when wound around a small diameter.

A process of preservation consists in fixing at certain distances on the leaden tube masses of iron or zinc, which would produce with the lead an electric element, and prevent oxidation of the lead. The exterior protective envelope or covering of these cables being of lead they are very flexible, and can be kept warehoused for any length of time. The insulating material can be varied to suit any particular purpose to which the cable is to be applied, and the invention is of especial value in connection with telephonic communication which requires a particularly good insulation of the conductor, an insulation which is very costly to obtain by means of existing gutta-percha cables. For underground work, and especially in combination with telephony, such cables would appear to be invaluable, as their first cost would be no greater than that of those in ordinary use, whilst they would be much more durable.

THE STUDENT'S TEXT-BOOK OF ELECTRICITY.

The unusually clear and accurate style of the writings of the late Dr. Noad, both on electricity and chemistry, is so well known to students that the mere announcement that a new and revised edition* of "The Student's Text-Book of Electricity," with an introduction and additional chapters by Mr. W. H. Preece, one of the vice-presidents of the Society of Telegraph Engineers, will suffice to ensure it a favourable reception. It is remarked that electricity and its applications have grown at such a pace that each particular branch demands almost a text-book of its own, and the ramifications of the science are so numerous that they embrace nearly every branch of physics in their sphere, for the electrician must be a fair chemist to comprehend the actions of the battery and the application of the current to electro-plating, he must know much of heat to follow the laws of electricity, he must know something of light to understand its application to electric lighting, he must master the principles of acoustics to learn its latest development in telephony, he must be a mathematician to follow its quantitative applications, and he must be a bit of a mechanic to undertake its practical developments, especially in telegraphy. The Student's Text-Book, however, assumes that he does not possess these qualifications, and the information given is chosen accordingly. Electricity is passing through precisely the same stages as its sisters heat and light have done. Early philosophers conceived each to be forms of matter, but they have been proved to be forms of energy. The applications of electricity have a decidedly civilising influence, and the tendency of all progress is to subdue this subtle agency more and more to be the helpmate of man. It has been utilised for domestic and commercial purposes, it has brought the world into one fold, it has become a great economiser of time, and a great regulator of the disposition of our movements, and therefore of our lives.

Though thunder roared and lightning flashed from the creation of the world, and the ancients were well acquainted with the peculiaties of the friction of certain bodies, it was not, as Mr. Preece remarks, until the seventeenth century that an electric machine was produced. The first half of the eighteenth century was marked by the introduction of the Leyden jar, and the second half by the discovery of the lightning rod. The nineteenth century commenced with the discovery of the galvanic battery (Galvani died in 1799), and of the electric arc, and the different epochs of this prolific century may be marked by the discoveries of electro-magnetism, induction, and magneto-electricity. There is no royal road to a knowledge of the science of electricity. The student must advance by steady, persistent toil. All our knowledge of the facts of the science has been acquired by observation and experiment, and it is by these two assistants that the student must proceed. The Text-Book will help him over difficulties which active observation will bring to his notice. The information in the new edition is certainly brought down to the latest date, the inventions of Bell, Edison, Gray, and other inventors whose names are now so constantly heard being fully referred to. An entire chapter is devoted to the telephone and the microphone, minute details being given with regard to the transmission of musical sounds. Reiss's apparatus, Wright's receiver, Gray's telephone, Bell's speaking telephone, Edison's carbon telephone, Hughes's microscope; and there is another chapter on the electric light, in which the lamps of Serrin, Rapieff, Regnier, Wallace, &c., are referred to, whilst the Jablochkoff candle, lamp, and automatic shunt, which may be regarded as the most advanced system of electric lighting yet devised, is so well described and illustrated that even the least initiated will be enabled to understand exactly the entire working. Not only is the book admirably arranged and printed, but being illustrated by nearly 500 engravings the information sought can be most readily and thoroughly obtained, and it cannot be doubted that at the present time the volume will prove an extremely interesting one to the general reader as well as to the student electrician.

AMERICAN ALMANAC.—To all taking interest in American matters, and at present there is so large an amount of social and commercial intercourse between the two countries that there are few who do not, the "American Almanac and Treasury of Facts, Statistical, Financial, and Political" (London: Trübner and Co., Ludgate Hill) will prove one of the most complete and convenient reference books published. The fact of its being edited by Mr. Ainsworth R. Spofford, the Librarian of Congress, is a sufficient guarantee for accuracy, especially as few other persons in the United States can possibly have so good a command of information. The sale of the previous year's issue was probably less than it would otherwise have been, owing to the too prevalent opinion that the almanac was a mere calendar, with statistics, &c., concerning the year to which it relates; so far from this being the case, it contains a number of really interesting and readable articles, which render the tabulated statistics much more valuable and instructive. The volume is one which few commercial men could afford to be without, as the facts which it will give them will enable them to economise the cost of it many times over in a brief period, whilst the general reader will find it well worthy of careful perusal and consideration.

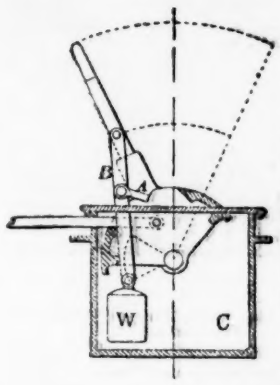
DICTIONARY OF LONDON.—The amount of information contained in the compact little volume by Mr. CHARLES DICKENS, just issued under this title (London: Charles Dickens, All the Year Round Office, Wellington-street), is really marvellous, and visitors to London could scarcely desire a more useful book of reference. It is entirely unlike any other guide book hitherto published, inasmuch as its object is not to select objects of interest for the reader to examine, but assuming that he has ascertained what he wants to see will assist him to find the object of his search, reach it by the most convenient route or conveyance with cost, and then learn what is interesting concerning it. Theatres, music halls, churches, Catholic, Ritualistic, and Protestant places of worship of Dissenters, and with respect to the ritualistic churches, the requirements of sightseers are considered to the utmost by the "special features" of the church service being given in a separate column, so that the reader can see at once whether vestments, plain or coloured, are used, and how nearly genuine Catholicism is imitated by the use of tapers on altar lighted or unlighted, whether the eastward position is assumed, and whether Gregorian or Anglican music is sung, what hymns are used, and when the pseudo masses are celebrated. With regard to theatres, clubs, tricks on greenhorns, &c., all are referred to in equal detail. It will probably surprise most theological students to learn that the terms of membership of the general Baptist place of worship is belief that Christ died for all, and not for a few only. The article on beggars is excellent. After describing what London beggars are, Mr. Dickens says—"To get rid of your beggar when wearisome, if he be English take no notice of him at all; he will follow you till you meet a more likely looking person, but no further. If your tormentor be an Italian, lift your forefinger knuckle upwards to the level of your wrist as it hangs by your side, and wag it twice or thrice from side to side. Your Italian who will take no other negative accepts that instantly. The whole of the information is given in a concise and interesting form, and the book is altogether one of the cheapest shilling's worth published.

OBTAINING MOTIVE POWER.—The invention of Mr. MAX MURET, of Shepherd's Bush, consists in improvements in machinery or apparatus for obtaining and applying motive power, whereby tramcars, tricycles, and other vehicles and machinery may be driven at a small expense of motive power. In carrying out the invention he employs a stand, semicircular in form, to which stand a rocking motion may be communicated. In the centre of this rocking stand he places a vertical lever with a weight at its free end, the said stand being connected by cranks or other suitable gearing to the driving shaft of the vehicle or machine to be driven. Motion is communicated to the apparatus by hand, or otherwise, by means of any suitable arrangement of levers or gearing. By this arrangement if the apparatus be set in motion great power will be obtained therefrom, and the power thus obtained may be utilised in driving vehicles or machinery.

* "The Student's Text-Book of Electricity." New Edition, carefully revised. By W. H. PREECE, M.I.C.E., V.-P. Soc. Tel. Eng. London: Crosby Lockwood and Co., Stationer's Hall-court.

SWITCHES AND CROSSINGS,

FOR RAILWAYS AND TRAMWAYS, WITH PATENT LEVER BOXES.



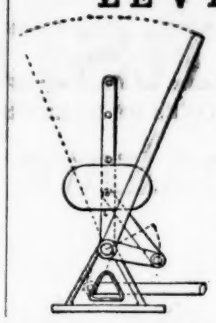
Hartley's Patent Lever Box,

REVERSIBLE UNDERGROUND,

Can be set to work either way; by turning over the catch at A and reversing the lever, the weight W swings over to C, the catch preventing its return until again turned over. The reversing is effected with very little power, as the weight is raised but a few inches in the operation.

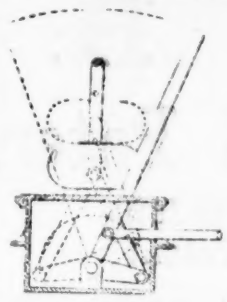
HARTLEY'S PATENT

LEVER BOX.



Specially designed for Colliery Workings, or where economy of space is an object. Is reversible, and can be locked either way, or dead-locked, so as not to work at all.

Hartley's Patent Locking and Reversible Lever Boxes,



HALF UNDERGROUND,

Will set over both ways, can be locked so as to work on one side only, or the switches can be locked on either side, so as not to work at all. Takes up less room than any other, as the weight does not turn over; works equally well if full of water; can be supplied at the price of an ordinary lever box.

Tank Locomotives, Siding Stops, Wheels, Rails, Chairs, Spikes. Bolts,

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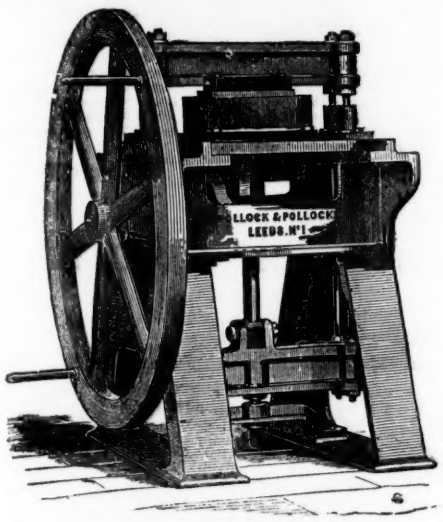

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" THE CRUMLIN VIADUCT WORKS COMPANY (LIMITED), South Wales.
" T. T. J. WALLER, Esq., Railway Contractor, Gisburn, near Skipton.
" TURNER AND SON, Limestone Quarries, Kiverton Park, near Sheffield.
" THE CLIFTON AND KERSLEY COAL COMPANY, near Manchester.
" THE ST. BRIDE'S WELSH SLATE AND SLAB COMPANY, Haverfordwest.
" THE WARTON LAND COMPANY (LIMITED), Silverdale, near Carnforth.
" THE MONTIPONI SOCIETY, Turin, Italy.

The following letter has recently been received from the Ebbw Vale Company:— Ebbw Vale Works, Monmouthshire, July 5th, 1878.

GENTLEMEN,—I have much pleasure in stating that in the execution of your contract to drive, for the Ebbw Vale Steel, Coal, and Iron Company (Limited), a cross measure Drift from the Old Coal to the Rock Vein Coal, in the Glyn Pits, at Pontypool, you did so with dispatch, and to the entire satisfaction of all concerned. The distance driven was 453 yards in about 13 months. Yours faithfully,

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Ebbw Vale Company's Collieries and Mines.

[The size of the above heading is 9 ft. by 13 ft.]

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Stones broken equal, and Ores better, than by hand, at one-tenth the cost.

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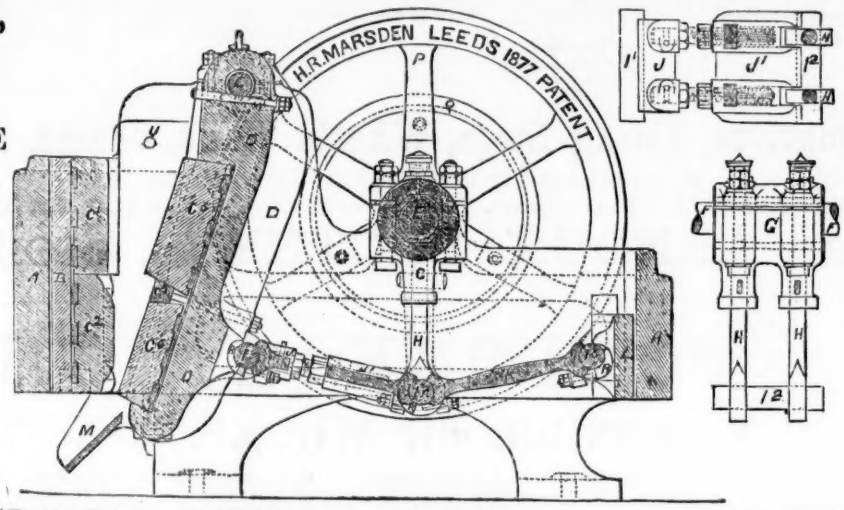

READ THIS—

Wharthole Lime Works, Maryport, Whitehaven, November 7, 1873.

H. E. MARSDEN, Esq., Soho Foundry, Meadow-lane, Leeds.

DEAR SIR,—The machine I have in use is one of the large size, 24 in. by 12 in. The quantity we are breaking daily with this one machine is 250 tons, the jaw being set to break to a size of 2¼ in. We have, however, frequently broken over 300 tons per day of ten hours, and on several occasions over 360 tons during the same period. The stone we break is the blue mountain limestone, and is used as a flux in the various ironworks in this district. We have now had this machine in daily use for over two years without repairs of any kind, and have never had occasion to complain of any inconvenience in using the machine. I hope the one you are now making for me may do its work equally well. The cost—INCLUDING ENGINE-POWER, COALS, ENGINEMAN, FEEDING, and all EXPENSES OF EVERY KIND—is just 3d. per ton. Should any of your friends feel desirous of seeing one of your machines at work, I shall have much pleasure in showing the one alluded to.

I am, dear Sir, yours very truly,
WILLIAM MILLER.

AND THIS—

Wharthole Lime Works, Aspatria, Cumberland, July 11th, 1878.

H. R. MARSDEN, Esq., Soho Foundry, Leeds.

DEAR SIR,—We are in receipt of your letter of 4th inst. I may just state that the stone breaker above named has been under my personal superintendence since its erection, and I have no hesitation in saying that it is as good now as it was five years ago.

I am, dear Sir, yours faithfully,
FRANCIS GOULD.

GREATLY REDUCED PRICES ON APPLICATION.

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Worked by their PATENT BALANCE-WEIGHT MOTION.

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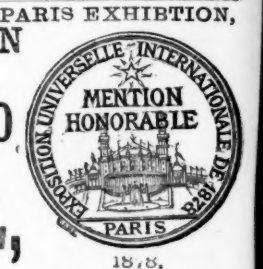

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